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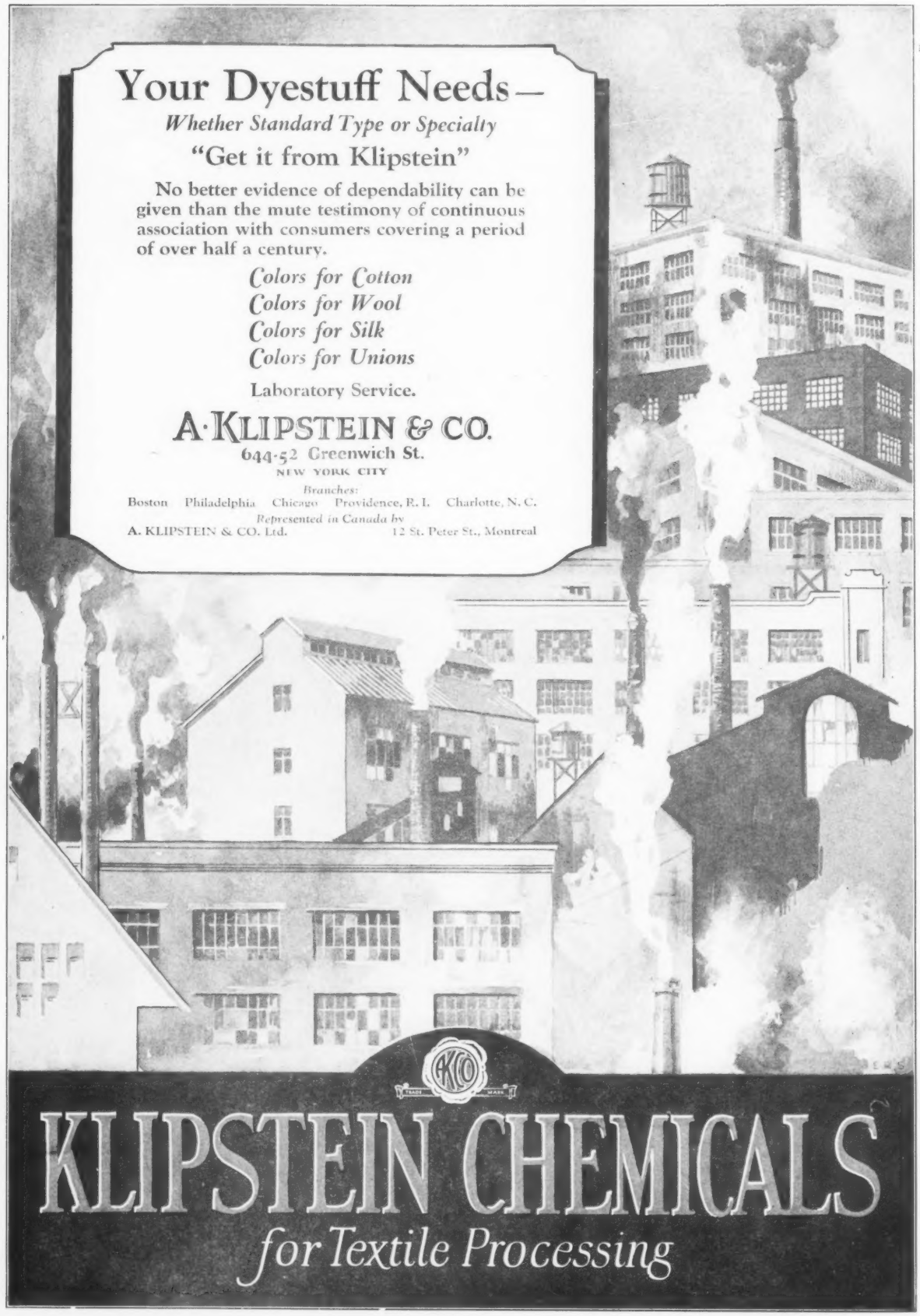
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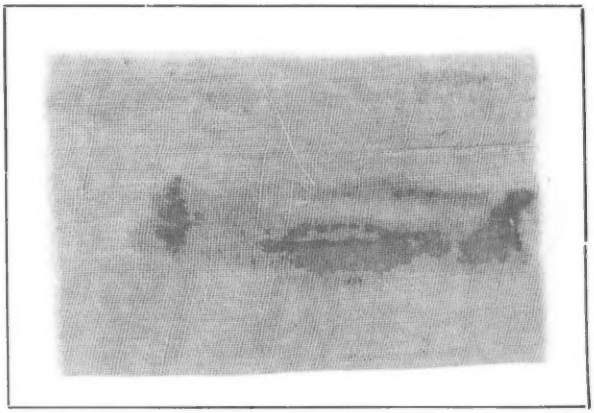

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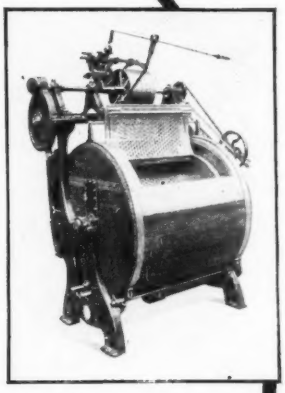

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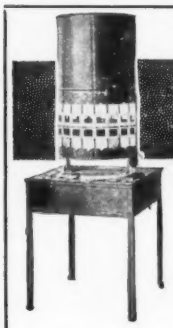

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The sticky deposits clinging to these textile fibres will show up as a defect in the finished goods. The mill's water supply is responsible for the presence of these deposits. From an original photomicrograph.

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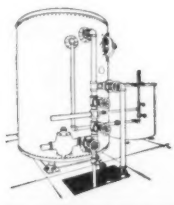

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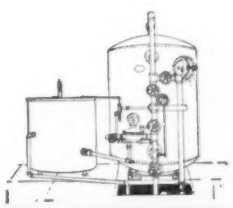

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Contents of This Issue

January 11, 1926

Acetate Silk—Its Dyes and Their Application—Part IV 1
Charles E. Mullin

Proceedings of the American Association of Textile Chemists and Colorists

Fifth Annual Meeting:
Saturday Afternoon Session (Concluded):
The Dyeing of Vat Colors on Rayon—*A Paper* by Floyd F. Warshaw..... 3
Discussion of Vat Colors on Rayon.... 6
Developments in the Naphthol AS Series—*A Paper* by Dr. H. E. Hager and W. R. Marsson..... 6
Discussion of Developments in the Naphthol AS Series..... 9
The Next Annual Meeting—*Address* by Arthur Thompson 12
Oiling of Cotton Preliminary to Spinning—*A Paper* by E. H. Hinckley.. 13
Discussion of the Cotton Oiling Process 16
Some Phases of the Cotton Oiling Process and Its Relation to Finishing—*A Paper* by Dr. Richard B. Earle.... 18
Further Discussion of the Cotton Oiling Process 21
The Dyeing of Viscose Rayon with Mordant Dyes—*A Paper* by Winthrop C. Durfee 22
Discussion of Dyeing Viscose Rayon with Mordant Dyes 22
The Dyeing of Silk White Effects on Woolen and Worsteds—*An Address* by Alan A. Claflin..... 23
Discussion of Dyeing Silk White Effects 24
Fifth Annual Banquet..... 24
Address by Dr. E. B. Millard..... 25
Address by Fraser Moffat..... 26
Address by Dr. Grinnell Jones..... 28
Address by Franklin W. Hobbs..... 29
Address by Dr. Edwin E. Slosson..... 30
Winter Meeting of the Southern Section.... 36
December Meeting of Rhode Island Section. 36
Applicants for Membership..... 36

Editorials:
Retrospections of a Spectator..... 37
Shade Card Information Regarding Action of Dyes to Metals 38
Dyestuff Tables 39
Technical Notes from Foreign Sources.... 41

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NEW YORK, JANUARY 11, 1926

Acetate Silk—Its Dyes and Their Application

Part IV

SUPPLEMENTAL TO THE PRECEDING SERIES OF ARTICLES ON DYEING ACETATE SILK

The Cellit Dyes—Extra Pastes for Acetate Silk—The Acetate Dyes—The Cellutyl Dyes—The Setacyl Direct Dyes—Fastness Properties and Application on Skeins and Unions

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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FURTHER investigation regarding the Cellit dyes, described in Part XIV, pages 624-5, indicates that these may be azo compounds of an acid character, and therefore possibly should be included under the heading of acid and mordant dyes.

Very probably the Cellit dyes are covered by British Patent No. 225,862, December 5, 1923, to F. Bayer & Co. This process covers the production of azo dyes by coupling diazotized dinitroanilinesulphonic or —carboxylic acid with an aromatic amine, which does not contain a sulphonic group, but which may be substituted in the amino group. For instance, 2, 6-dinitroaniline-4-sulphonic acid and *B*-naphthylamine, or *a*-naphthylamine, or ethyl-*a*-naphthylamine; 2, 4-dinitroaniline-6-sulphonic acid and ethyl-*B*-naphthylamine; and 2, 4-dinitroaniline-6-carboxylic acid with ethyl-*B*-naphthylamine, give products which dye acetate silk deep red, Bordeaux, violet, blue and bluish-violet shades respectively.

The "Extra Pastes for Acetate Silk"

(Note—The author is indebted to Miles R. Moffatt, of Kuttroff, Pickhardt & Co., for information upon the application of these products.)

British Patent No. 204,280 and United States Patent No. 1,526,142, which was given on page 625 of Part XIV in connection with the Cellit dyes, may cover the production of "Yellow 3G Extra Paste for Acetate Silk," "Yellow R Paste for Acetate Silk," "Orange Extra Paste for Acetate Silk," "Pink R Extra Paste for Acetate Silk," "Red-Violet Extra Paste for Acetate Silk," "Violet B Extra Paste for Acetate Silk," and "Blue Extra Paste for Acetate Silk." These dyes are applied to acetate silk by the usual direct methods, as given in Methods No. 122 and No. 123. When applied to cotton-acetate silk unions in light shades, the cotton usually remains unstained, but heavier dyeings generally tint the cotton somewhat. They may be applied in the same dye bath with most direct cotton dyes.

Method No. 122: *"Extra Pastes" on Acetate Silk.*—The paste is first diluted with water at the ordinary temperature and mixed well. This is sieved into a dye bath containing about two grams per liter of green olive oil soap depending upon the depth of shade, or an equivalent amount of Turkey Red oil, Brilliant Monopole oil, or similar preparation. For light or medium shades, enter the goods into the lukewarm dye bath and dye for a half to one hour at 50 to 70 deg. Cent. (122 to 158 deg. Fahr.). Darker shades may be entered at a higher temperature. The dyed material should be rinsed and brightened in a cold formic or acetic acid bath. The same method is used for piece dyeing.

Method No. 123: "Extra Pastes" on Unions.—For two-colored effects upon cotton-acetate silk unions, by the single bath method, 5 to 20 per cent of calcined Glauber salt should be added to the dye bath, as given in Method No. 122. All soda or other alkalies should be strictly avoided. Solid shades are dyed in the same manner. Care should be taken that both fibers are alike in tone, but the acetate silk rather on the light side of the cotton.

The Acetate Dyes

Without doubt the acetate dyes described at length in Part V of "Dyeing Acetate Silk" (page 317)

are acid dyes suitable for application to acetate silk for application to acetate silk for light shades. The use of acid dyes as mordants for the basic dyes on acetate silk has been discussed under the basic dyes, and Table No. XXIV gives formulas for a number of colors on acetate silk by means of the acetate dyes, topped with basic dyes. Many other acid dyes may be used in the same manner as "mordants" for basic dyes, thereby giving deeper shades of increased fastness. Method No. 32, page 317, covers the application of basic dyes to the acid dye mordanted acetate silk.

The Cellutyl Dyes

Some information regarding the Cellutyl dyes was given on page 317 of Part V. In addition to those enumerated, there is also Cellutyl Bright Red, Cellutyl Fast Red D, Cellutyl Fast Lilac and 2B, and Cellutyl Sky Blue. These dyes stain cotton and the other rayons more than do those given on page 317. Possibly some of these dyes are basics.

Method No. 124: The Cellutyl Dyes on Acetate Silk.—Most of the Cellutyl dyes, particularly those given on page 317, are applied by the methods generally used for the direct dyes on cotton, that is, in a bath containing about 20 to 30 per cent of sodium chloride, at about 85 deg. Cent. (185 deg. Fahr.) for an hour or less. In some cases, especially in the case of those which stain cellulose, as, for instance, Cellutyl Sky Blue, it is necessary to add about 2 per cent of acetic acid with the salt. When dyeing cotton-acetate silk unions the Cellutyl dyes are frequently applied in the same bath with the direct cotton dyes.

In addition to the acid and mordant dyes given in Part V, the following acid and mordant dyes may be applied to acetate silk by Methods No. 30 or No. 31.

Brilliant Orange M
Soluble Blues
Fast Light Yellow G
Fast Yellow GL
Fast Yellow G
Indian Yellow G
Indian Yellow R
Orange II Conc. Special
Orange RO
Resorcinol Brown R
Acid Scarlet 4R
New Ponceau 4R
Azo Acid Cardinal
Fast Red A
Fast Red A New
Rhodamine B
Nigrosine B Crystals
Induline 5B

(Continued on page 38)

Table No. XXIV

Colors Obtained With the Acetate Dyes Topped With Basic Dyes

Formula No. and Color	Acetate Dye	Topped With
1. Moss Rose	1.50 per cent Acetate Red A	0.01 per cent Rubine Small Crystals
2. Orange-Pink	1.20 per cent Acetate Yellow R	0.10 per cent Rubine Small Crystals
3. Red	0.30 per cent Acetate Red A and 0.60 per cent Acetate Brown O	0.30 per cent Rubine Small Crystals
4. Eglantine, 0.2242	3.00 per cent Acetate Red A	1.50 per cent Rubine Small Crystals
5. Muncio, 0.7021	0.50 per cent Acetate Red A and 0.20 per cent Acetate Brown R	0.30 per cent Methyl Violet 6B
6. Reddish-Violet	1.00 per cent Acetate Red A and 0.20 per cent Acetate Brown O	0.50 per cent Methyl Violet 6B
7. Mallow, 0.2703	3.00 per cent Acetate Red A	1.00 per cent Methyl Violet 4R
8. Greenish-Blue	0.15 per cent Acetate Red A	0.30 per cent Methylene Blue 2B New
9. Light Blue	1.50 per cent Acetate Red A	0.20 per cent Methylene Blue 2B New
10. Bluish-Gray	3.00 per cent Acetate Red A	1.40 per cent Ethyl Green Crystals
11. Bright Green	1.00 per cent Acetate Orange G	0.15 per cent Methylene Blue 2B New
12. Green	0.50 per cent Acetate Brown O	0.30 per cent Malachite Green Crystals
13. Bright Grass-Green	2.00 per cent Acetate Yellow R	1.00 per cent Methylene Blue 2B New
14. Grayish-Olive	3.00 per cent Acetate Brown R	1.20 per cent Methylene Blue 2B New
15. Steel-Blue	0.5 per cent Acetate Brown O	0.30 per cent Methylene Blue 2B New
16. Butterfly, 0.5311	1.00 per cent Acetate Yellow R	1.00 per cent Methylene Gray B New
17. Olive	2.00 per cent Acetate Brown O	2.00 per cent Methylene Blue 2B New
18. Light Gray	0.50 per cent Acetate Orange G	1.00 per cent Methylene Gray B New
19. Tan	1.00 per cent Acetate Orange G	1.00 per cent Methylene Gray B New
20. Brown	1.50 per cent Acetate Brown O	0.20 per cent Methylene Blue 2B New
21. Brown	2.00 per cent Acetate Brown O	0.20 per cent Methylene Gray B New
22. Violet-Brown	0.75 per cent Acetate Brown O	0.10 per cent Crystal Violet 6B
23. Golden Glow, 0.3006	2.00 per cent Acetate Orange G	0.10 per cent Chrysoidine Extra

Proceedings of the American Association of Textile Chemists and Colorists

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FIFTH ANNUAL MEETING

Saturday Afternoon Session Concluded, and Fifth Annual Banquet

[NOTE.—The Proceedings of the Saturday morning technical session and of part of the Saturday afternoon session (December 5, 1925) were published in the Proceedings of December 28. Following are the papers and discussions that concluded this technical session, beginning with the paper by Floyd Warshaw on "The Dyeing of Vat Colors on Rayon." The report of the Fifth Annual Banquet also follows.]

Floyd Warshaw—Some time ago, at the very kind invitation of Dr. Killheffer, I had the opportunity of telling my fellow members of the New York Section of the American Association of Textile Chemists and Colorists about a little discovery of mine. Well, he has called on me again, and this time I am going to tell you something about my business. It is young, but I think in that way I can tell you something about the dyeing of vat colors on rayon.

. . . Mr. Warshaw then presented his paper:

The Dyeing of Vat Colors on Rayon

By FLOYD F. WARSHAW

Before entering the commercial or custom dyeing line I had the gool fortune to be associated with the Newport Chemical Works, of Passaic, N. J., in the capacity of a practical demonstrator and investigator of fast dyes on rayon and other goods. Very often I had the opportunity of going into some of the largest and best equipped dyehouses in the country. During my stay at the different plants I worked with the dyers and together with them solved many problems, in the handling and working of the yarns, which had given them much trouble. I also had the opportunity of seeing large lots dyed, and in turn was often given the chance to show what I could do in the way of introducing new ideas in the working of the vat dyes.

As a result of these trips I began to realize just how important a commodity fast dyed rayon was; that it was destined to take its place among the largest industries of the world, and that the possibilities were unlimited. It was because of this that I decided to enter into the fast skein dyeing field.

Being associated with the Robison Rayon Company, which caters particularly to the cotton goods weavers and the woolen and worsted industries, I am in a position to know the needs of the consumers of fast-dyed rayon. This firm handles all sizes of deniers, ranging from the finest filaments to the coarsest twists. Every bit of their thread is dyed in our plant and processed in their mill.

Therefore I am now going to try to convey to you some of the problems that confront the practical dyer of vat colors and also just what both the owner and dyer have to look out for in the dyeing, processing and finishing of fast-dyed rayon.

The average commercial dyer comes in contact with any number of types of rayon. The principal ones are the nitro-cellulose, cuprammonium, viscose and cellulose acetate silks. Of these the viscose rayon is used chiefly, while those of the acetate group possess many character-

istics which make it superior to the others, such as a certain amount of elasticity and a greater tensile strength when wet as well as when dry. These, however, have not as yet become very popular because of the special type of colors required. No doubt as soon as new dyestuffs are perfected that will give satisfactory results this new processed rayon will be used in greater volume. I might add that even now there is a very satisfactory line of colors which can produce a fairly wide range of shades. Nevertheless, the price of cellulose acetate silk still renders its use prohibitive in a great many lines where viscose is being used. Since I have not had much experience with the cellulose acetate silks, I am going to give them a wide berth in my lines and devote my talk to the viscose group.

I have read many articles on the dyeing and finishing of vat colors on rayon, but not one of the writers told what actually happened to a batch of yarn, designated for fast dyeing, from the time it reaches the dyehouse in the natural state to the time it leaves completely finished and ready for winding. I am therefore going to try and tell you something about fast colors on rayon by having you follow me through the procedure the dyer resorts to in the coloring of a lot.

The commercial dyer must accept all kinds of silk from his trade. He gets both the domestic and the imported, each having their peculiarities and characteristics. Before attempting to dye the silk he himself or his assistant should examine the lot. He must watch out for endy silk; i. e., skeins which have broken strands. He must examine it for fuzziness and tight tie-bands, also for an excess amount of oil. Some manufacturers of rayon do make a practice of putting some oil in their silks for certain trade requirements; but often this is overdone, causing dull and lifeless yarn. Cotton tie-bands on the skeins do not slip as easily as silk bands, and therefore are best suited for vat dyeing. All these points are very important in the manipulation of the dyeing process. The man in charge of the work must alter his methods of dyeing and handling in accordance with the condition of the yarns. This is certainly necessary, because the one object in dyeing fast colors on fine denier rayon is to try and obtain the required shade with the least number of operations. The more sets or immersions the lot is given the more difficult it is going to be to wind. After all, that is what counts with the converter and weaver.

Now let us go on to the actual operations which the yarns undergo in the plant. After the lot has been carefully gone over, it is stuck upon rods made of bamboo. It is very important when dyeing rayon of 80, 100 or 150 denier that the sticks on which the silk is placed be smooth and not cracked. Oftentimes a good lot of yarn is made fuzzy because of the carelessness of the dye-helpers in not selecting perfect sticks. The number of skeins to be put on a rod should be limited, so that there shall be no overlapping. Failure to do this will produce shady and streaky results.

In selecting the dyestuff for the particular shade the dyer must pay strict attention to the fastness requirements of his customers. If his goods are to go into embroidery yarns the colors must be of very good fastness to light and washing. If he is doing work for the cotton goods trade his colors must stand bleaching, light and severe washing, and if the rayon is intended for woolen goods to be used in pencil stripes, decorations or facing, the colors must be fast to an acid cross-dyeing at a very high temperature and also must be fast to light. I might illustrate by taking one of the requirements—say, fastness to bleach. Supposing we had a blue shade which necessitated the use of the popular GCD and RS brands. These colors are not fast to bleach, and therefore would not be satisfactory. However, we have two substitutes in Blue BCS and Blue RC. The former could take the place of the GCD and the latter could supplant the RS. These two colors have very good fastness to the normal bleach and will stand up under the usual laundry test. This problem of fastness is a source of great worry to the dyer, and many times the inexperienced will take for granted the extreme fastness of a color to all elements and tests just because it is a vat. If it is necessary for the dyer to use a combination of dyestuffs he must choose those that will dye well together. They must be of such a nature that will require about the same reducing and dyeing temperatures and also the same amount of alkali. Some vat colors reduce and dye best cold; others warm, from 105 to 120 deg. Fahr.; while still others are best dyed at a temperature of from 140 to 160 deg. Fahr. Still others will yield best results at 176 deg. and even 200 deg. Fahr. The dyestuffs that are best dyed cold require a minimum amount of caustic soda and also a quantity of Glauber salt, the amount depending on the depth of the shade. Even though the percentage of good results obtained when using mixtures is high, it is advisable, wherever possible, to use straight colors.

I think the trade can be educated to the standard shades, in some cases. If when making sample dyeings for his customer the owner of the dyehouse will tell him that by accepting the shades submitted his yarn will wind and finish better, I have no doubt but what the consumer will agree. A good deal of trouble could be avoided and better results obtained if both the dyer and his customers would get together on problems of this sort, especially in the sampling season, when new shades are being originated. This suggestion merely applies to fast-dye work, where the process is considerably longer and more difficult.

Bearing these facts in mind, let us now go on to the wetting out and dyeing of the yarn. A suitable box, either of wood or Monel-metal, is filled with the required amount of water; namely, about 250 gallons for 100

pounds of rayon. About 1 pound of sodium-hydrosulphite and caustic soda is added to the bath to take care of the oxygen in the water and also to put the stock in a semi-reduced state. This precaution greatly assists the dyer in obtaining level results and a uniform shade throughout the lot. A small amount of ordinary joiner's or carpenter's glue will serve to slow exhaustion and so give the dyestuff a chance to work more evenly on the fiber. It is also quite neecssary to include a quantity of Monopole oil, which tends to soften the yarn, make it more pliable and aid levelness. This should be a good sulphonated castor oil which will not decompose in working. The water containing these four ingredients is now heated up to a temperature of about 105 to 110 deg. Fahr. The rayon is given a thorough wetting out in this liquor and then laid up preparatory to dyeing.

The dyestuff is now reduced in a separate container. This is filled with water heated to the necessary temperature for reduction and the caustic which has previously been dissolved poured in. The color is then added, and while stirring very gently the hydrosulphite is slowly sieved in. This is allowed to stand until completely reduced. Experience is the best teacher in this particular branch of the operation. The dyestuff must be fully reduced to obtain consistent results, and therefore the ability to tell a reduced vat from one vat in perfect reduction is of the utmost importance.

The method used for applying the dyestuff is dependent upon the depth and character of the shade to be made. If the so-called mode or pastels are to be dyed, the following procedure has proven very satisfactory. The temperature of the box is brought up to 100 deg. Fahr. and a very small portion of the stock vat added. This should be just enough to tint the yarn and form a ground, or base as I call it. From experience I have found that no matter how much a lot is worked it will never even up properly if it had not been started right. The rayon is then given three quick turns and laid up. Another portion is added, about twice as much as the initial one. A small quantity of hydrosulphite added to the bath between each set serves to keep it in a good reduced state. The lot is then given four turns and again laid up. The temperature of the bath is raised to 110 deg. Fahr. and half of the remaining color added. Four turns should be enough to exhaust that addition. On the last set the balance of the color is added and the temperature raised to the degree designated for the particular dyestuff being used. The batch is again put back and given five turns. A sample is made and the match checked back. This method has given very good results; and while the number of sets that the silk is given may cause the dyer some alarm, careful manipulation and an exhaustive study of conditions will overcome most of the troubles that may arise. When dyeing deeper shades it is not necessary to work the yarn in this way. However, no matter how dark the shade is it is always advisable to start the dyeing with a small amount of color. Then the remainder can be added in two portions. In some cases, where the dyestuff is naturally a very good leveler, all the color may be added after the initial tint is made.

If the dyeing is complete and no further addition of dyestuff necessary, the yarn is immediately given an oxidation in a bath containing bichromate of potash and acetic acid, or it can be hung up on racks to oxidize naturally. This usually is dependent on the color or colors used. I have found that some colors or shades have to be aired first and then given an artificial oxidation. Unless this is done streakiness will result and a shade not as bright as the standard will develop. Others can immediately be plunged into an oxidizing bath without altering or injuring the shade in any way. After the yarn has been properly oxidized it is given a fresh-water and then a hot soaping, say, at a temperature of 140 to 145 deg. Fahr. A small amount of Monopole oil in the soap will tend to drive out the harshness which is bound to be imparted to the rayon by the caustic soda and hydrosulphite in the dye bath. The soap is left in the silk and the lot headed up and transferred to the extractor. There it is whizzed well and then taken to the finishing department, where it is shaken out and put on sticks. These are placed on a truck, which is wheeled into the drier. When completely free from moisture the skeins are carefully gone over, examined for fuzziness, loose ends, ragged tie-bands and the like. The bad skeins are culled out. Often light and dark skeins appear in the batch. The first thing one naturally assumes is that the dyer was careless in handling the lot. This is not always the case. Though there has been a vast improvement made in the quality of rayon in recent years, there still appears to be a certain percentage of skeins in some lots which seem to have a greater affinity for the dyestuff than the others. There is no apparent way for the dyer to remedy this condition, and the only thing he can do is to weed out the skeins which show a marked difference from the remainder of the lot. The rest of the silk is rolled up neatly into compact and uniform bundles, and then sent back to the converters or consumers. Our dyehouse has been most fortunate in the satisfactory results obtained and in avoiding and overcoming the difficulties described.

Before concluding I would again like to review the important points in the dyeing and finishing of fast skein dyed rayon. We must always keep sight of the winding condition of the yarn we are dyeing. Rayon is a very difficult fiber to handle and requires skillful manipulation in dyeing. It is very smooth and slippery. It comes to the dyehouse in the form of skeins, the threads of which are interlaced with tie-bands. Some manufacturers use silk for the bands and others cotton. The latter is much

more satisfactory for fast color work. We have the advantage of being affiliated with a converting house from which we learn of the needs of the winders. I have the opportunity of watching my yarn spool, tube and cop, and I can safely say that our work has improved a great deal since I have had the chance to study the converting of rayon. I also want to stress the importance of selecting proper dyestuffs for use in combinations.

The problem of soft finish in the dyeing of vat colors is quite an important consideration. When the yarn arrives at the dyehouse it is soft enough for the average uses. However, when subjected to fast color dyeing it loses nearly all of its softness and attains a coarse, harsh feel. This must be corrected with a good softener, such as a sulphonated castor or olive oil.

I could go on and tell you about fast-dyed rayon for the next hour and still not exhaust the phases of it worthy of discussion, but I feel as though I have conveyed to you some of the more important elemental facts about the topic "Vat Dyes on Rayon." I certainly do feel that this is a subject worthy of a great deal of attention: first, because it has solved problems in striping, filling and decoration too numerous to mention, for the cotton and woolen manufacturers; the second reason is that it is lowering the price of fine goods containing fast colors by supplanting pure silk and thereby placing these commodities within the reach of everyone. It is gradually working its way into the braid, wire and upholstery trades, and every season sees its use being extended into some new and untried commercial field.

Discussion of Vat Dyes on Rayon

President Olney—We are thankful to Mr. Warshaw for this valuable paper. It cannot help but be of value to those who are actively engaged in the application of vat dyes to rayon, and I think here is a very profitable field for discussion. Have you any questions to ask or any statements to make to supplement this paper? We seem to have rather an indifferent lot here this afternoon, because I know there are a number here who are particularly interested in this subject.

W. F. Deady—I would like to ask the speaker if he has had any experience in dyeing up the bleached rayon and the unbleached rayon.

Mr. Warshaw—Both.

Mr. Deady—Do you have to change methods any?

Mr. Warshaw—That all depends on the shade. Of course, the bleach is more desirable for light shades, and that requires an altering of your methods.

Mr. Deady—I mean, in dyeing the same shade, some of it bleached and some of it unbleached, mixed together, do you get the same results?

Mr. Warshaw—That would make a difference, if it were a light shade. If you have bleached stock you will sometimes get different results when dyeing a certain shade than if you were dyeing a natural yarn unbleached.

Mr. Deady—Take viscose, for instance, made by the viscose process, by two different manufacturers, and suppose you had some of each mixed in a lot, would there be any difficulty in dyeing an even shade?

Mr. Warshaw—Yes; the silks of some manufacturers seem to have a different affinity for the dyestuffs than others.

We had the experience of getting a new shipment of silk in that required more dyestuff for a certain shade than the old silk we had been using, both coming from American manufacturers.

I would like to add that I have some samples here of some of the shades we have dyed in our plant, and I certainly would be glad to show them to you if you are interested, after the meeting is over. It would take up too much time to show them now.

Winn. W. Chase—I would like to ask two questions. The first one is: Do you know whether the fastness properties of the vat colors are the same on rayon as on cotton?

Mr. Warshaw—I believe they are different in some cases.

Mr. Chase—The other question is: Did you mention whether you use straight rods or bent rods?

Mr. Warshaw—I don't believe I mentioned that. We use straight bamboo rods.

Herbert Grandage—You mentioned several times the importance of selecting a certain type of tie-band for your skeins. Can you tell me what the weight of skeins in the tie-band should be, and the length of tie-band?

Mr. Warshaw—I don't quite understand what you mean.

Mr. Grandage—You mentioned that you preferred a cotton tie-band rather than a silk tie-band.

Mr. Warshaw—Silk bands slip very, very easily, and are not suitable for fast color work where the bath is always in a highly alkaline state.

Mr. Grandage—Does it make any difference in the actual manipulation of the silk whether you have a silk band, or just how long your bands may be in the skein?

Mr. Warshaw—No, as long as the band isn't too tight.

President Olney—Are there any other questions? If not, our next subject is, "Developments in the Naphthol AS Series," by H. E. Hager and W. R. Marsson. Mr. Hager!

Developments in the Naphthol AS Series

By H. E. Hager and W. R. Marsson

It appears that so far two papers have been presented on this subject in the United States, both of them before this Association. The first one, by Dr. Rose, was read about a year ago in Philadelphia and dealt almost entirely

with the scientific side of the subject. Dr. Rath, of Griesheim, presented the second paper last May at Newark, and he was the first one to speak of naphthols from the coloristic standpoint.

The forerunner of naphthol was the old Para Red. This is obtained by impregnating cotton with beta-naphthol, then drying the material and passing it through a developing bath of diazotized para nitra aniline base. This gives a beautiful bright red; but it has the drawback of being none too good to washing and light, and of subliming off the cloth. It also has very poor fastness to crocking. This is due chiefly to the fact that beta-naphthol possesses no substantivity to cotton. It is, therefore, only surface-coated on the fiber; and that, incidentally, makes the drying after the prepare necessary.

More than thirty years elapsed after the discovery of Para Red before the Griesheim Company in 1912 brought out the Naphthol AS, which is the anilid of beta-oxy-naphthoic acid. This invention gave the whole problem of dyeing ice colors a different aspect. It was proven that Naphthol AS would give, with the different bases known at that time, a series of very bright and fast shades, fast not only to washing and to light but also to chlorine, and, if not exactly fast to crocking, at least vastly superior in this respect to the old Para Red; because Naphthol AS possesses a fair-size substantivity to the fiber, and that eliminates the drying process after it is prepared.

Shortly afterwards, Griesheim brought out the second representative of the naphthol class (AS/BS), which produces bluish shades and is used chiefly as a shading naphthol. However, the time before the war was too short to give these products a start, and more than ten years passed before the Naphthol AS took a firm foothold in many dyehouses, particularly for the production of its well-known red shade with meta-nitro-para-toluidine.

In the meantime, Griesheim had greatly enlarged the range of their naphthols. They brought out first the Naphthol AS/BO, which stands out for some beautiful Bordeaux and wine shades, and somewhat later the AS/RL type, with which it became possible to produce shades of such superior fastness to light that naphthols could be used for draperies, and even awnings, with great success. Combinations with Naphthol AS/RL possess, even as pinks, such excellent brightness and fastness as can be obtained otherwise only with vat colors, at three and four times higher expense.

The series was further enlarged by the invention of the naphthols AS/G, AS/BG and AS/BR. With the help of these, it became possible to obtain any number of yellow shades and some most valuable brown types which in their fastness properties rival with the best of the others. Naphthol AS/BR belongs, with another type (the slightly older AS/SW), in the class of fully substantive naphthols, which form an invention of extreme importance.

Whereas the older AS types could be used economically only in cases where the cotton came in short contact with the dye liquor, it is now possible to exhaust the dye bath almost completely and thus open the field of naphthols to machine dyeing.

These types act like direct colors, or even better, since they will exhaust in a lukewarm bath. They eliminate the necessity of dyeing in a standing bath and can be used for all types of machines and for all forms of cotton; that is, for raw stock on the Hussong, Chattanooga or similar types, and for spun cotton on the Franklin, Thies, Morton, Brandwood and continuous warp dyeing machines, as well as for piece goods on the jigger and padder.

The fact, formerly much complained of, that ice colors tend to crocking, was most successfully overcome by the discovery that the prepared ground of these types was so well fixed to the fiber that a washing in an alkaline salt bath would remove all surplus naphthol without washing off the prepare itself; that it would, therefore, remove the possibility of any surface lake formation—which is, of course, the source of all rubbing troubles.

The most popular shades from these substantive naphthols are the Flaming Red from AS/SW, and Fast Red KB Base, which stands a caustic boil, and the Black from AS/SW and Black LB Base, which is, as all naphthol azo colors, fast to chlorine.

By combining the ten naphthols known at present with the eighteen bases, a very large variety of shades can be produced. This can be widened still further by mixing those naphthols together which belong in the same class as regards their substantivity. We have ever been able to mix certain bases with each other successfully. It is thus possible to dye almost any shade of yellow, orange, red, scarlet, Bordeaux, and some very fine blues, browns and blacks, but it has not been possible so far to dye green or violet, or the infinite variety of delicate mixed shades, such as heliotrope, tan, mauve, taupe, and so on. However, in our very latest achievements let us hope that even this will be accomplished.

It was found in our laboratory, and last month successfully demonstrated in the South on a continuous warp machine, that naphthols can very successfully be mixed with Indanthrene colors. For instance, a bright green can be produced by adding to the alkaline solution of the Yellow Naphthol AS/G a certain amount of hydrosulphite reduced Indanthrene Blue BCS, then passing the goods through this, and afterwards through a solution of suitable fast color salt or diazotized base. Such a green is about as fast as an Indanthrene combination, and costs not much more than half as much.

This opens a very promising outlook. It allows us to

hope that we will eventually be able to produce almost any shade with naphthols by the addition of small quantities of Indanthrenes, and thus combine brightness and fastness with greatly reduced costs.

After this interesting invention—for which, incidentally, patent rights are being prepared—we went into further research, and we have just found that naphthols can, in a similar way, easily be combined with sulphur colors. There are numerous cases where such combinations will fill a gap; shades can be obtained which could not be produced with sulphur colors alone. The cost is not very materially increased; and, of course, the fastness is quite considerably improved, particularly to chlorine.

There is no reason why such combinations, particularly with Indanthrenes, cannot be made for delicate shades also, as we have proven in the laboratory by making some tans, heliotropes, and so on. However, the economic advantages would be proportionately smaller. We have therefore come to the conclusion that naphthols should be confined to medium and heavy shades, of which particular fastness is required, and where the cost of Indanthrenes is prohibitive. Light tones, with the exception of pinks, should preferably be dyed with Indanthrene alone.

Dr. Rath, in his lecture in May, stated that Griesheim, after a great deal of research, brought their fast color salts out on the market. They constitute the completely diazotized and neutralized bases in the form of a salt which is easily soluble in water, and they are therefore a most welcome achievement for the dyer.

The diazotization of a base, with its somewhat complicated chemistry, with its accompanying expense of ice and lots of chemicals, and also with its development of unpleasant nitric acid fumes, has very frequently been a stumbling block to the introduction of ice colors. These salts eliminate all these troubles. They reduce the whole dyeing process to an extremely simple performance; and, last but not least, they do not involve any higher expense.

When working with these fast color salts, however, one factor should be taken into consideration. They contain as a stabilizing agent aluminum sulphate, which with the Turkey Red oil of the preparation will form insoluble, sticky aluminum soaps, which are somewhat difficult to remove from the fiber, and will therefore interfere with the spinning process. We have not, for that reason, recommended these salts for raw stock.

Griesheim, however, has not rested on this point. They have just brought out a new type of salt (Fast Red GLA) which is free from all this trouble. The letter "A" in this name represents "apparatus," because this will be the ideal product for machine dyeing, and all kinds of material can, of course, be dyed with this type of salt, and we hope that soon we will have every one of the bases in the form of these A-salts.

Up to this point I have spoken only about the application of naphthols on cotton. Conditions with artificial silk are very similar. Since this fiber is dyed almost entirely in skein form, and on the open tub, the substantive naphthols are preferably used, and a great number of very fast and bright shades can be produced.

Acetate silk, or Celanese, however, possesses no substantivity to naphthols whatever; on the other hand, this fiber can be dyed by reversing the process; that is, by first dyeing the Celanese in the hydrochloride of the base, then diazotizing the fiber and afterwards passing through the naphthol baths. This process, however, is of very little practical value, with the exception of Celanese Black, from dianisidine base, which is frequently made.

Naphthols are not confined to the cellulose fiber alone. It was found that they can be used quite successfully for silk also. The process is only slightly different from that employed in dyeing cotton, since it appears advisable to add some Protectol to the alkaline bath in order to preserve the fiber. Furthermore, the developing bath should be kept on the acetic acid side to obtain the true shade, as the neutral or alkaline base will in itself give the silk a yellowish color, which would then have the tendency of throwing the final shade over to a yellow cast. By employing substantive naphthols and by rinsing after the preparation, it will be possible to get very good fastness to crocking; and, in fact, all properties will be in every respect proportionate to those on cotton.

Only last month the range of naphthols was still further enlarged. The Hoechst Company, in conjunction with Griesheim and Bayer, brought out two new types—Naphthol AS/TR and AS/D. The first one stands for Turkey Red, since it gives with the equally new Fast Red Base TR the true Alizarine Red shade, which, with its fastness, could previously be obtained only by a most complicated and laborious process. This new shade has the quality of being able to stand a pretty severe caustic kier boil, which makes it of particular interest to the towel trade as an ideal substitute for Turkey Red.

The second one, Naphthol AS/D, is excellently suitable for the printing trade, as the letter "D" from the German "druck" indicates.

This leads our discussion of naphthols to the second form of their application, that of cotton printing, which we can classify into direct and discharge work.

For direct printing, the goods are prepared with the naphthol and are then printed with thickened base or fast color salt. A steaming operation is not necessary. The unprinted spaces will not in every case show a perfect white, since the preparation of certain naphthols leaves a faint yellowish tint. Most of them, however, show perfectly, and these two new types are excellent in that respect.

When naphthols must be printed alongside of chrome or basic colors, a prolonged steaming becomes necessary. This has a tendency to alter a few of the shades. AS/D and AS/TR are, however, types which are not in the least changed. They lend themselves, furthermore, remarkably well for discharge printing, giving a perfect white or very clear color discharges with great ease, particularly when used with the new bases Fast Red TR or KB and Fast Scarlet TR.

There is, on the whole, some difference in the dischargeability of naphthol azo colors. A few combinations give an excellent white with rongalite alone. Others require anthraquinone or leucotrope besides, and some do not discharge at all. The majority of the shades are, however, easily dischargeable.

Finally, a few words must be said about the interesting class of rapid fast colors. This group constitutes color pastes, which consist of the stable mixtures of certain naphthols with the nitrosamines of certain bases in an alkaline medium. A combination of the two components under formation of the color takes place under the influence of weak organic acids. The application, therefore, is extremely simple, as the name indicates. A fair-sized number of rapid fast colors have been brought out for the production of self-shades which can, by the addition of chromate or Ludigol, be printed alongside of chrome or basic colors, and they will then be stable to a prolonged steaming. The rapid fast colors should not be mixed with each other. However, it is possible to produce every shade of the rainbow if they are mixed with Indigosol O or O4B, and a few stock pastes will enable the printer to produce a multicolored variety of shades by simple blending. The printed goods are aged in the air or fixed by a short Mather Platt steaming, and are then merely passed through a hot acetic or formic acid bath, before they are soaped and washed.

The effects are quite remarkable, since these colors possess both fastness and brightness, and have for this reason found quite a market in Europe, particularly in England, for the production of printed dress goods, furniture and curtain cloths. Rapid fast colors are also of interest for yarn and block printing on account of their simple application and the fact that the steaming operation is not absolutely necessary.

With the short time at our disposal, it is not possible for me to go into details. I would like, however, to show you some of our prints and dyeings, and I would like to invite a discussion. Those questions which I may be unable to answer will probably be met by Mr. Marsson, who has successfully demonstrated on a practical scale the application of naphthols in Europe and, in the last year, all over the Eastern and Southern sections of the United States.

Thank you. (Applause.)

Discussion of Developments in the Naphthol AS Series

President Olney—This is certainly a very valuable paper. There is one question that I would like to ask, and that is with regard to the relative cost of producing a certain shade with the naphthols as compared with the older para-red method.

Mr. Hager—The para-red is, of course, an extremely cheap type. I do not know exactly what it costs per pound, but I should say it is not much more than three cents. Naphthol colors will in any case cost between eight and ten cents per pound. Of course, pinks naturally are very cheap. Pink will cost only about three or four cents, or less.

President Olney—I think there are many questions that might be asked on this particular subject. Perhaps first we will call on Mr. Marsson, who may have something additional to say.

W. R. Marsson—I feel that those new experiments in combining naphthols with sulphur colors and vat colors should be of considerable interest to the gentlemen present, and in this connection I would like to make just a few remarks.

My experiments in that line, of course, have been very recent, but they have been very encouraging indeed.

With reference to the continuous machine, and speaking about extremely bright green shades, I have done this: I simply made up my naphthol bath as usual, and on the side I made up a reduction of the vat color. Indanthrene Blue in this case is very good. Alizarine Indigo Blue is also good I picked out Indanthrenes which are fast to chlorine for that purpose, in order to get that fastness all around. Of course, this reduction has to be made up separately. After the solution is properly made, the reduction has to be added to the naphthol bath. Then, of course, care has to be taken to see that the reduction in the machine—in the box, in other words—is also good.

In warp dyeing, the matter of feeding is very important. Of course, feeding of two separate barrels would not be advisable. I have found, especially in long runs, if you have a warp of 2,000 or 3,000 yards you have to make up your feeding solutions in one barrel or two barrels, to take care of just as much as you have to feed. In naphthol, for instance, if I have a warp of about 3,000 yards I put in one-third of the entire solution and feed about two-thirds. This I do, too, with the Indanthrenes.

The first run produces the yellow, which the naphthol by itself gives with the Indanthrene. A second run through the naphthol bath is mainly for the purpose of evening up the entire lot and, furthermore, exhausting the bath.

Then, a very important thing is the squeeze. The squeeze is one of the secrets of naphthol dyeing, anyway, for fastness to washing. You must remove as much

naphthol liquor as possible and as much caustic as possible from the fiber in order not to get the bath alkaline.

In developing this combination of Naphthol AS/G and Indanthrene GCD, as an example, I use the Fast Scarlet Salt 2G, which alone produces an extremely bright yellow with Naphthol AS/G. The result obtained I have found to be very, very satisfactory for greens, but I must say, again, the squeezing effect must be very good.

This field is still open for experiment. I have not as yet tried it on closed machine dyeing, as we all know that even vat combinations alone—Indanthrene Blue, Indanthrene Yellow—are not very easy to get absolutely level, even if we dye in the open tub.

In the naphthol bath, on account of the concentration I find it is easier to obtain level dyeing. Then, after the squeeze, one run through the developer should be sufficient.

The bases, with hardly an exception, diazotize conveniently, and the concentration in the developing box is about the same as in the naphthol. Then, after the developing, the first rinse bath should be kept acid.

I would like to switch off here for a minute to the old combination of AS/G base or AS/GL salt, just to give you, I might say, a piece of advice. I have found in a good many mills in this country that the first rinse bath after the developing bath is just a plain water rinse. I find that the addition of muriatic acid is very beneficial for the fastness to crocking, and the muriatic acid tends to practically dissolve the formation of the aluminum soap; and it is this aluminum soap which smuts the dyed fabric. I think the addition of muriatic acid will overcome that trouble.

We also tried to get a purple shade. A vat purple is brighter, there is no doubt about it, than a naphthol combination. We have picked out for that purpose Naphthol ARL, which produces some very bright wine shades; and the addition of an extremely bright Indanthrene Blue, of course, produces some of the purple shades. Here we found the fastness to be extremely good. I was surprised to find how fast these combinations are to chlorine. They stand very well.

I want to encourage these tests. If any of the gentlemen are interested in this, our services will be gladly given, and we would like to work the thing out together continually. The tests have absolutely shown that it can be done and that it can be done economically; and that, I should say, is a very important factor.

As far as the combination of naphthols with sulphur colors is concerned, there are very few shades which come into consideration. As Dr. Hager has said, the question of extreme brightness and body is a matter of importance. For instance, a maroon shade or, let us say, a burnt orange shade can be produced through a combination of sulphur colors and naphthols at considerably less cost than it can be produced by sulphur colors alone. Only about a half per cent of the naphthol combination, or even a quarter per cent, of the weight of the material will give that improvement to the sulphur color.

Let us say you have a dyeing of about 10 per cent for a heavy tan or brown. A slight addition of the naphthol combination producing wine shades gives a beautiful body.

I recently made a dyeing using a substantive naphthol along with sulphur colors; I was very careful on the caustic and on the salt, and I was careful on the matter of temperature. Of course, you must get it as cold as possible in order to get the levelness, because a substantive naphthol tends to exhaust very quickly. Then, if you develop it, the green foundation of sulphur colors and naphthol—even without developing—show very badly. But this also can be done, and I have tried several of these naphthols in this direction. Here, too, the cost can be considerably reduced.

I simply offer to you these few words on this absolutely new line of combining naphthols with vat colors and sulphur colors. If there are any questions that you would like to ask about machine dyeing, or substantive naphthols, I will be glad to answer them.

Floyd Warshaw—In your work have you done any large lots of rayon with the naphthols?

Mr. Marsson—No; this question of rayon in large quantities is not quite solved yet. We have dyed as high as 50 pounds. Of course, the handling of the silk there plays a very important part.

Mr. Warshaw—How many operations do you think would be necessary?

Mr. Marsson—You can take a substantive naphthol which practically exhausts on rayon about 80 to 90 per cent. Those substantive naphthols are limited to AS/SW, AS/BR. Then, of course, there is your squeeze, your hydro-extracting, and afterwards developing. That is two operations. The important thing is the application after treatment. In after-treatment you have to give an acid bath in order to get the silk clean, and then soap, not too hot. I have found that about 170 or 180 is as high as you can go in soaping rayon silk.

I hope soon to be able to get further information on that subject.

John F. Warner—I would like to ask Mr. Marsson if he thinks the naphthols as a class adapt themselves to basic color discharge.

Mr. Marsson—Yes.

Mr. Warner—Are there any limitations?

Mr. Marsson—Yes, as Dr. Hager has stated.

Mr. Warner—What combination would you suggest as the best for producing a good red on cotton to discharge with vat colors?

Mr. Marsson—The best dischargeable colors are the Naphthols AS/BS and the new types AS/TR and AS/D.

You can always get an absolute white discharge. The other naphthols tend to a yellowish tint. The disadvantage of the AS/BS type is the fastness to light. It is not as fast to light as the others.

Mr. Warner—Is it possible to obtain good results, where you don't want to get a white but want to use colored vat discharges, with the AS/RL?

Mr. Marsson—Yes. I should like, in this connection, to pass around a few samples that we have here.

Mr. Warner—In that case, where you are using the naphthol AS/RL, what base of salt do you use?

Mr. Marsson—Fast Red RL Base.

Dr. Hager—We have here a little card showing seventy-five different combinations, all of which show very good, bright discharges.

President Olney—Are there any further questions?

A. C. Persons—I would like to ask about AS/BO going into the salt. There seems to be some trouble in connection with the wetting out of the yarn, probably due to that aluminum sulphate. How do you overcome that?

Mr. Marsson—You mean, dyeing in the open tub?

Mr. Persons—I mean, you have trouble from the BO going into the salt. The yarn doesn't wet out.

Mr. Marsson—In those cases, of course, I increase the amount of oil a little bit, and I find that if you naphtholize your skeins, entering them dry, you get better results and more even results than if you boil them out before entering wet.

Mr. Persons—You have trouble handling them dry; before you can get all your yarn in, one part of the color is all developed. Consequently, you don't get an even shade.

Mr. Marsson—With the naphthols you can increase your temperature, or your oil, and in the developing bath use a penetrating agent like Mekel.

Mr. Persons—After treating your yarn with BO, your yarn is dry and the BO gets into the salt.

Mr. Marsson—What do you use naphthol for?

Mr. Persons—For a little faster color. We find we get some sublimation.

Mr. Marsson—If you dry your material in between after naphtholizing. I don't like to have it too dry, however. It is the same as piece dyeing. The pieces should be dried after they are naphtholized, in order to get better fastness to crocking; but don't get them bone-dry; just get them fairly dry. That is rather important, because the developing action is very quick; and there, of course, it is a question of time.

Mr. Persons—There is no trouble with the bases, but when you go on to your salts, then your trouble begins in getting out your yarns.

Mr. Marsson—Yes; I will have to agree with you about that.

Stewart Carter—I would like to ask how many chains you run in a set. You say you have 2,000 or 3,000 yards to a chain.

Mr. Marsson—Four.

Mr. Carter—That is what was in my mind: I think that most of us here have had to do with cotton warps. Our warps run about 6,000 yards. There would be 378 ends to a chain. In ordinary dyeing, we double those down to 750 yards; in one run that takes about twenty minutes, which would mean somewhere between thirty-five and thirty-seven yards per minute. Would it not be better in your process to run the doubled warp?

Mr. Marsson—It would, no doubt. It is always a question of getting your squeeze effect; don't get the concentration of your naphthol bath too high, and get your solution perfect.

Mr. Carter—You set your naphthol bath, then, at a certain strength and you feed on the run, so that at the end of your run your naphthol bath will be simply the same strength as at the start?

Mr. Marsson—Yes.

Mr. Carter—How many sets would you run before you let off?

Mr. Marsson—I usually make up my liquor—let us say, for instance, so much water is taken out by the warps. Experience shows how much you need. In that amount of water which I have to feed I make up my naphthol solution and feed on during the operation. Let us say I put one-third into the box and feed on two-thirds. You can divide it over two runs—that is better still, because the second operation is practically nothing more than a leveling operation. I have found that it is well to make up my solution in this way: Say I have 100 pounds of dyestuff, just roughly figuring; I use 75 pounds for the first run, 25 in the box and 50 to feed; the remaining 25 pounds is used as a safety measure and is fed during the second operation. I have found that I get the best results in that way.

Mr. Carter—Then you will have in your box for a set like that about 250 gallons?

Mr. Marsson—For a set like that I will have between 200 and 250 gallons.

Mr. Chapin—I would like to ask about the fastness to light of this green. I have heard various reports about the fastness of yellow to light. Does that stand up well?

Mr. Marsson—The fastness of the AS/G Scarlet Salt as a yellow is about as good as any vat yellow on the market. One of my customers has exposed it himself and found it a trifle better. The fastness of the vat blue you use along with the naphthol is the same as if you used it by itself. So we should consider the fastness to light about five, I should say, if you go by the range of five, using five for Alizarine Red fastness.

President Olney—Are there any further questions?

A. D. Nute—I would like to ask Mr. Marsson if there is any good method of resisting these ice colors except by the use of tin crystals.

Mr. Marsson—We haven't experimented along that line, but there is no reason why they should not be successfully resisted by any known method. They are very fast to cross-dyeing, too.

Mr. Nute—I want to get a resist to be used with vat colors.

Mr. Marsson—Tin crystals should be all right.

Mr. Nute—You can't do much with steaming.

Mr. Marsson—We haven't done much along that line, but we will go into that.

Mr. Thompson—In using 250 gallons, which you mentioned, does that mean British gallons or United States gallons? There is a difference, you know.

Mr. Marsson—We figure here always in United States gallons.

President Olney—Are there any further questions? We certainly made no mistake when we put this subject on the program. It has created a great deal of interest.

President Olney—Before we return to the regular program, I wish to say that there was one question asked this noon by a gentleman who wasn't as well versed in regard to the methods of determining hydrogen ion concentration as he wished to be; he inquired as to the best books on the subject that went into sufficient detail and in a sufficiently elementary manner as to make it worth while to study over. I am going to ask Dr. Scott to answer that question, because he is better able to do so than I.

Dr. W. M. Scott—I would recommend "The Determination of Hydrogen Ions," by W. Mansfield Clark, Ph.D. This book is written in sufficiently simple language so that persons who have not had the advantage of special instruction in this subject can obtain a good working knowledge without becoming too much involved in scientific detail. At the same time, if they wish to pursue the subject further this book gives a number of references to other sources of information, which, in fact, constitutes a very complete bibliography on the subject.

The Next Annual Meeting

President Olney—I think this is also an excellent time to mention the matter of the next annual meeting.

You may know that at the Council meeting yesterday it was voted to hold it in the South a year from now. Arthur Thompson is here as a representative of the Southern Section, and I think perhaps it would be well for him to say just a word in regard to their invitation and to emphasize the desire that we have for a full attendance at that meeting. We would like to see at least one hundred, two hundred if possible, of the Northern members in attendance at that meeting, but we are not as hopeful as that.

Mr. Thompson! (Applause.)

Arthur Thompson—The Southern Section of our Association has been organized not quite two years. They have a membership of between one hundred and two hundred members, who attend the meetings very regularly, in spite of the fact that a great many of them have to travel overnight to come to our regular bimonthly sectional meetings. That shows the enthusiasm that they have and the interest that they are taking in our work.

Our annual meetings have been held for the past four or five years entirely in the North, in New York, Providence, Philadelphia and Boston. It is only fair to the Southern Section, who are members just the same as you are up here, that the meeting be held in the South at least once in five years. So the Council accepted the invitation of the Southern Section, at its meeting yesterday, to meet with us in the South next year, and we hope that as many as can will avail themselves of that opportunity to see the South, to see the textile manufacturing interests that have been developed there.

We propose to give you what they call in the South a real Southern welcome. We will do our best to give you a good time so that you will be glad to come back when it is our turn to entertain the Society again. We hope that here will be two hundred there. I think you ought to be ashamed of yourselves if you don't have one hundred there, but we will make up the rest of the number in order to make the meeting as well attended and as interesting as the meetings that are held in the North. I am sure that everyone who goes will feel well repaid for his time and effort.

A large number of the firms represented here to-day have branches or mills in the South. Some of you have been to them. Some of you have never been to them. This will be your opportunity—your excuse, if you will—to visit those plants.

We propose to take you on trips down there showing you the various textile plants in the South, and we will do our utmost to entertain you in any way that you may want to be entertained. We have the largest towel mill in the country only about twenty-five miles from Charlotte, the Canon Cotton Mills. We have one of the largest single cotton mills in the world only fifty miles from Charlotte. That is considered a stone's throw, by the way, gentlemen. Someone over here wants to know who threw the stone. (Laughter.) We will be able to take you to those various interesting points.

So let me just drop a suggestion that you form a committee at once, the Boston Section, the New York Section, the Providence and Philadelphia Sections, and arrange to have a special train bring you down there. You can get twenty-eight in a single Pullman, and you should

have a whole trainload; at least, four or five cars filled. I can assure you that you will have a good time and will want to come again when it is our turn to entertain the second time.

I thank you, gentlemen. (Applause.)

President Olney—Any men connected with the woolen business have known from the very beginning the complications and the vagaries in regard to the oiling or lubrication of wool. In quite recent years it occurred to the cotton men that their spinning operations might be somewhat facilitated if oil were added to the cotton, the same as it has been added to wool previous to carding and spinning. That being the case, we thought it well to introduce upon the program this afternoon the subject of oiling cotton preliminary to spinning, and Everett H. Hinckley is going to give us a talk upon that subject, which we hope will open a discussion.

Oiling of Cotton Preliminary to Spinning

By Everett H. Hinckley

Gentlemen, I don't know how deeply interested you will be in the part of this subject that I may give to you, because I have in mind just giving you a brief outline of what has been done. Of course, it does not directly involve anything distinctly chemical, except in the development of the product. It is more distinctly mechanical in its application. Perhaps I will be rambling along a little and you may get out of patience with me, but I will try to cut it short even if I ramble.

Speaking of rambling makes me think of the only story I know Last night there was a story pulled off by our entertainers that was so aged that even I knew it, and I am encouraged from the fact that went over so well to tell you this story.

It is my hope that a large number of you will go South next year, because I think you will be surprised to see the development of the cotton industry in all its branches down there, if you haven't already been there and seen what has been done.

At any rate, the man about whom this story is told went down South. He was one of those gentlemen who like to make short addresses on the spur of the moment. But he usually carried in his pocket the same address, which by a slight changing of title would fit in anywhere he went.

Well, he got into a small town whose most prominent citizen had recently died. They thought it would be a nice thing to erect a monument to his memory. Feeling that they would get more funds if they put more names up there, they raked up a couple of older men of the community—that is, the names of men who had died previously—so that all in all they had three names on this thing. These names were all engraved on the memorial that was being erected, and this man was to make the speech.

He got up and ran along for a moment until he forgot his line. He kept looking on the inside of his coat. Finally, after stuttering a little, he went on with his story as follows: "We came here, gentlemen, to honor the memory of Hart, Schaffner and Marx." (Laughter.)

So if I pull off anything like that you will know I am looking at my notes. Fortunately, I have no names on the inside of my coat, though.

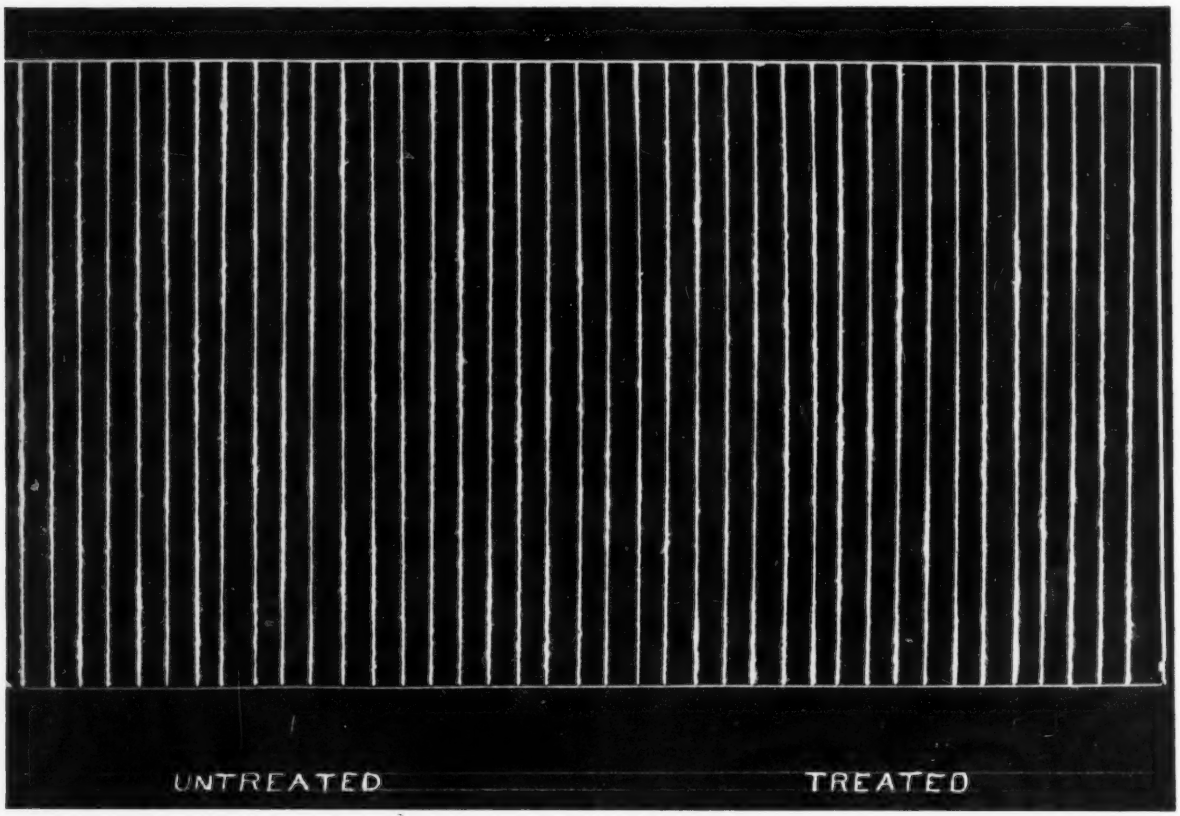
The subject of oiling wool, as Professor Olney has said, is a very old one and one that the woolen people were driven to from the earliest history of the spinning of woolen fibers. Because of the shape of the wool fiber they could not handle it; the serrations of the fiber would catch upon each other and thus make a tangled mass that could not be straightened in parallel. In cotton, that condition never existed to anywhere near the same intensity. Cotton has upon it, of course, varying proportions of waxes and oils which furnish the lubrication anyhow—natural lubrication. Also, cotton fiber, being a flattened spiral, has not the tendency to tangle in the same way that wool has. A third factor is that the cotton fiber has not the tendency to felt with its neighbors the way wool fiber does. Of course, wool fiber, under the action of heat and alkali, will mat together with its neighbors very tenaciously.

Those factors being absent, there was very little done in the way of adding lubrication to cotton fiber, although I might state, begging Professor Olney's pardon, that the thought is quite old. I have a number of references which I didn't bring with me. I have a reference from about 1801 to an Englishman who conceived the idea of oiling cotton fiber and he made some tests on it, but not very successfully. Of course, that was way back in the early history of spinning cotton, and you can understand that many other factors entered into it.

But recently—and in this I may use the personal pronoun considerably, because I have to use what knowledge I have—we conceived the idea that the matter of oiling cotton fiber, while perhaps not as important and absolutely necessary as that of oiling wool, did hold out considerable advantages to the cotton spinner, if it could be done properly.

With that idea in view, we naturally started with what we knew about oiling wool, and in a short time convinced ourselves that we knew very little about the oiling of cotton; that the problem, as I said a little while ago, was an entirely different problem; that it wasn't a question of making the fiber workable, but it was a problem of making it more workable than it is to-day.

The result of the preliminary investigations brought us down to the fact that cotton can be oiled, and thus prevent the "wildness" that is spoken of, which is due to the



Showing Relative Evenness and Freedom from Wildness When Cotton Fiber Is Treated With Breton Minerol Process Before Picking.

rubbing of the fiber across other materials. That produces a statical change, or unbalances the statical charge.

It was found that the amount of oil that could be put on was very small, and within very narrow limits; that there was a maximum and a minimum limit. I might say that you could put on too little oil and the cotton wouldn't run as well as it would with the proper amount. You could also put on too much oil and within comparatively narrow limits you could get the cotton mill so that they couldn't get the cotton through the cards at all; you would simply stop the mill.

Of course, those things were interesting and finally we determined the limits within which cotton could be run successfully. From then on we have been carrying on the marketing of oils for that purpose, and we think with considerable success with regard to the reaction of the cotton spinners toward it.

The oiling is accomplished on the raw fiber. It must be applied perfectly uniformly. You can't put on spots of oil, and then have spots of dry fiber. If you do that you will bring about a worse condition than if you had no oil on, because you will have a condition there that will be tolerant to water; and the function of the oil, of course, is to prevent the condition which the moist atmosphere discharges.

This is usually done right after the cotton has been passed through the bale-breaker, or at the picker.

Perhaps at this point you may jump at the conclusion that dyed cotton receives the most benefit. We thought it would, but we found it did not. The cotton that is not dyed apparently receives the most benefit from this process, the factor entering there apparently being that you cannot add to the dyed cotton fiber a sufficient quantity of waxes and place them there in the same way that they are placed there by nature. Therefore, you cannot put on enough to get the same condition. But if the fiber is already covered with this natural coating, we can add enough to that to make added surface lubrication.

As the cotton goes through the mill we find that in the cleaning processes there is a slight difference; that is, the cotton cleaning is a little bit better—we think it is. It is not remarkably noticeable, but it certainly does not clean poorer, as one might think who has had experience with the spraying of water. Spraying of water on cotton fiber, of course, will cause the motes and dirt of all sorts to stick to it. The spraying of oil apparently doesn't do that, and

if anything it makes those a little easier to drop out through the cleaning process.

When it comes into the carding room we find that the cards must be properly ground, clearances made slightly less. If they are not properly ground, that will clog up. It is in the card room that the first distinct advantage is seen. We had this very strikingly illustrated in a mill in Griffin, Ga., about a year ago. They had five pickers and in the card room they had five rows of cards following these pickers, one row of cards after each picker. We stood in the overseer's gallery, which was at the farther end of the card room. At that time they had two pickers running with oil and three without. It almost seemed as if the air had been cut down vertically where the cards without the oil were, because of the lint in the air. In other words, oiling practically eliminates all lint in the air. A part of that lint consists doubtless of fibers that are broken in the cleaning processes, which by the use of oil are not broken. Part of it is fibers which are thrown out because of the fact that they are not long enough to hang in the web, and they can, we find, be either retained or thrown out in the strips as we wish, according to the setting of the card. So that it doesn't interfere with the making of the web. In fact, it makes a better web, and you can have the full length of staple in there, without broken selvages.

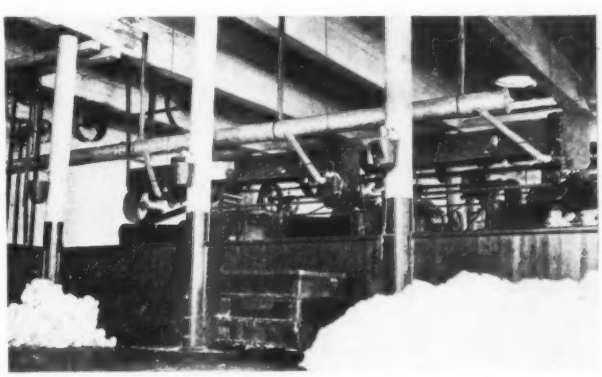
In the drawing and twisting, of course, you commence to see quite distinct differences in the way it works, as you will easily understand that with this added lubrication on the fiber the fibers will draw along each other better and more freely. The tendency to have lumpy yarn is reduced because of the fact that with this added lubrication the possibility of fibers tangling with their neighbors and producing the lumping is reduced.

The same thing is noticed in the twist. When you come to twist the yarn, you will find that you can put in more twist, if you wish, without interfering with the breaking strength of the yarn. Of course, those familiar with the spinning of cotton yarn know there is a maximum twist that can be put in, and beyond that you seriously interfere with the breaking strength of the yarn, probably due to the cutting of the fibers across each other.

We also find that the actual production is greater. You would naturally expect when you see the fly disappearing from the mill that it must go somewhere, and thus the losses which are spoken of as invisible losses appear in the finished yarn in added weight. The consensus of opinion to-day, based upon well over two hundred installations, is that they gain about 2 per cent in added weight. As an average, two-thirds of that 2 per cent is cotton that at other times would appear in sweepings and waste of distinctly inferior value.

Up to this point, where the cotton is spun in the yarn, and the next step, when the yarn is woven into cloth, naturally there is no difficulty that calls for consideration from a chemical point of view, although the question has been raised from time to time as to whether it interfered with the sizing. This is something we have never gone into because of the fact that it looked so elementary to us that the lubricant couldn't cause trouble. You always have to add to any sizing material (such as starch or gum) something in the shape of fat or oil to prevent it from being too stiff; and as the proportion of lubricant put on the yarn is relatively smaller, or not by any means greater than what you put in warp sizing, we have never given it very serious consideration. As a matter of fact, I don't think it injures it, as we have heard nothing to that effect. There are now a number of mills running sheetings and shirtings, which, of course, would call for good warp sizing. They are not having any trouble in that respect.

Beyond this point, of course, is where most of the members of this Association begin to get distinctly interested, and that is in questions as to how will such cloths and yarns made on this system process in bleaching, for instance. That is a point which we had in mind when we first started to solve the problem of lubrication, and no effort was made to process any goods until we had a lubricant that would, in the conditions to which cotton is subjected, completely emulsify. We find that it does, as we anticipated; that is, the lubricant softens and carries with it the cotton wax and emulsifies other foreign ingredients so that they are removed in scouring more readily than is usual. This statement is supported by the fact that the whites of cotton cloth that is made of oiled yarns when bleached stay white longer; that is, they don't brown, which always to my mind was an indication of insufficient scouring. In other words, if you haven't scoured out all the coloring matter and other foreign material from the inner part of the fiber, the fiber acts like a wick to bring it to the surface when the goods are allowed to



Showing a Three Picker Mill Equipped With the Breton Minerol Process

lie over a period of time, particularly in a warm place; which, of course, hastens that wick action.

In the dyeing, the same or similar results were obtained. Sulphur dyes were one of the first classes of dyestuffs we took up. When we dye sulphur colors directly (that is, without first scouring) on piece goods, where they had lubricating oil stains on them, you know what happens. Naturally, one of the strong objections to our process was that while it may help in the processing of the cotton and give a better yield in the cotton mill, in the dyehouse especially if you dye with sulphur dyes, you have badly stained goods. But it works here the same as it does in the scouring for bleaching. The initial application of oil at the picker is very small, and during the time elapsed from when the oil is put on until you get it to the dyehouse the oil has had a full opportunity to mix and amalgamate with the hard waxes, and so forth, on the fiber; and, of course, the mechanical action of the carding and the twisting and drawing process are all tending to produce a more intimate mixture with these impurities which is of itself much easier to emulsify than the original wax. At any rate, no difficulty has been encountered in that field.

Another objection was brought on this class of goods (made of oiled fiber) by the tire goods people. The objection was raised that the presence of oil on there would interfere with the proper coating and rubberizing. I don't think that was very seriously brought by the tire manufacturers themselves, as they know that considerable quantities of such materials go into their compounds and the presence of this small amount of oil would not interfere to any great extent. But the mills themselves which make tire products have had it impressed on them that oily goods (stained with lubricating oil and containing at the spot a content of oil of 100 per cent or more) wouldn't go, and this was another case of oily goods, although to the naked eye and also to the "feel" there is no oil whatever.

I am glad to say that that has been overcome, by no other means than their making sufficient and proper tests, and we now have some very satisfactory reports on it. There are several mills now that have run for an extended period of time making tire yarns whose whole output is sold for that purpose, and we have confidential reports from two of the largest tire companies in the United States acknowledging the advantage of our process, in one of which the statement is made that there is absolutely no question about the coating of the fabric; it is coated as easily as usual. In one of the other reports the statement is made that the elasticity of the yarn is definitely and distinctly increased. This is a point that was particularly interesting to them, and they expect to get decidedly longer wearing tires. Their laboratory tests indicated that they would gain about 100 per cent in the life of the tire because of the fact that the fibers were so easily bent back and forth that they did not break within the usual period of time. There are a good many such tires running on the roads to-day, and so far as I know they have been entirely satisfactory in their results.

I think I have gone over the whole subject, although perhaps not as deeply as you would have liked me to. I did really intend to have some pictures here of the fibers to show you how they look with the oil on them and how the yarns look with the oil on them, and comparing before and after taking, like the patent medicine people do. Unfortunately, however, I haven't them here; perhaps it is fortunately, because you might think they looked too much like patent medicine, as they show up very nicely.

If there are any questions you care to ask I will be glad to answer them. I know there are two or three here who are looking for my scalp; they told me so last night. Perhaps they will speak up first. (Laughter.)

Discussion of the Cotton Oiling Process

President Olney—I was looking around to see if I saw anyone with a hatchet. If anybody has any questions to ask this is his opportunity.

Stewart Carter—I would like to ask Mr. Hinckley one question, and that is about the quantity of oil. I understand that the amount that has been found satisfactory is slightly under 1 per cent of the weight of the cotton.

Mr. Hinckley—The average in over 200 mills to-day is about three-quarters of 1 per cent. It varies widely within narrow limits.

Mr. Carter—But it is somewhere about that?

Mr. Hinckley—That is the average. The highest we have ever used is up to 4 per cent, but we didn't have any great success with that amount. In certain kinds of fiber we get up to 2½ per cent with great success. In other fibers—for instance, Egyptian fibers—the percentage which we put on is comparatively small.

Strange as it may seem, the drier the cotton is the more difficult it is to oil; but if you remember a remark made about dyed cotton you will see that it fits in with that.

Mr. Carter—It certainly seems very reasonable to suppose that a slight oiling will increase the working of the cotton, when we come to look at it in this way: as I understand (of course, I may be wrong), in 1 pound of cotton there are somewhere around 140,000,000 ultimate fibers—

Mr. Hinckley—I don't know, I never counted them. (Laughter.)

Mr. Carter—Take a cotton coming along from your card—you begin to go through the operations, drawing, slubbing, intermediate, then on to your roving and spinning. During all those operations there is a draft on and the cotton is moving, the fibers are moving one past the

other, and the more parallel they get and the more even the more even the yarn is. When you come to examine it on an examining board, you begin to find how you have come out.

I have been very much interested in this, and I think it is one of the things that will be a standard operation in the future. I think Mr. Hinckley has done a good deal, and that people in the cotton business should be grateful to him for the part he has played in bringing this very rational subject up and for doing what he has in developing it.

Fred A. Hannan—I would like to ask the speaker what operation he would prefer for spraying this oil on dyed cotton, and what type of oil he would suggest?

Mr. Hinckley—The first part of that question is easy: the place where the cotton is best opened. Usually that is in the hopper of the breaker picker. As your cotton comes from the dyehouse, you dry it and then carry it along to the breaker. It can't be put on there. It has to be put on when the cotton is open and agitated because uniform distribution of the oil is absolutely essential. But as to that, and as to the oil, that is a thing that took a good deal of study and a good deal of effort to reach a conclusion on, and all I can say is that the type of oil which we use to-day we think is the best.

Of course, in selecting the oil there are a number of things to think about outside of the dyer and finisher which we have to think about the very first thing. Here we have the question of card-clothing. Those of you familiar with the operation of a mill know that the injury done to card-clothing is cumulative and may be extremely serious, and that it is easily injured by certain types of oil reaching the clothing and softening the backing up so that the wires will not hold their original position, either in respect to each other or the distance away from the card cylinder.

So an oil would have to be devised that wouldn't do that. That means you must cut down the fluidity of the oil so it won't run easily along the wires.

On the other hand, of course, our whole problem was to get on a maximum amount of lubrication. If we put on, as the woolen people do, anywhere from 4 to 20 per cent of oil, we have so much liquid on there that the cotton fibers cannot be drawn by each other; that is, it ceases to be a lubricant and becomes a sort of cementing body to hold a number of fibers together in a bunch.

We finally worked out an oil which has about the fluidity of a loom oil, but it has much greater lubricating power. By that I mean it has the power to lubricate about six times as much surface as such an oil would cover. In that way, you see, we cut down our liquid to one-sixth of what would normally be used.

One of the oils that we considered seriously, for instance, was sulphonated oil. It is a standard product on the market and can be purchased easily; it is of good purity and reliable in the relative percentages. But we soon found that sulphonated oils acted upon the card-clothing, not so much on the base as on the wires, and soon the wires commenced to lose their keen edge, due to the action of the acid and the reaction of the oil itself, and the web passing through the cards assumed a dark hue, which proved to be iron being dissolved from it.

Another natural oil to use would be a fat blended oil, but considering the fact that cotton is so susceptible to spontaneous ignition we soon discarded that. There have been a number of tests carried on here in Boston in the insurance laboratories, showing plainly the reasons why it was discarded. In cotton, small quantities of fat oil are very liable to produce spontaneous ignition, and under the conditions (the oil being put on in the picker and carried on in all the processes, stored here and there in places where the access of air is slight and the temperature is high) it is very liable to produce fires.

I think that answers the question fully.

H. R. Davies—From the dyeing and bleaching standpoint, the question of whether or not the oil is saponifiable is of practical importance. You mentioned that the oil was entirely emulsifiable. Do you mean by that that it is not entirely saponifiable?

Mr. Hinckley—I mean exactly that: that it is our idea (and we believe it is well based) that the use of saponifiable oils is not so advantageous as the use of emulsifiable oils.

You had a little discussion about kier boiling last night and that was indirectly brought out.

Why does a lime boil give a better boil than a soda boil? It is a question there of giving it sufficient time and using proper means to get a good emulsion of the fats and waxes on the cotton. On the other hand, if you tried to saponify all those materials off you would find that it was a very slow process. Saponification doesn't go forward very fast. I meant exactly what I said: it should be a perfectly emulsifiable oil, but one that is not saponifiable in itself.

That obviates that difficulty and, of course, affords us the opportunity to use oil which will not alter under any condition that is ordinarily found in the storage of the goods, from the time they start at the mills to the the time they are delivered to the customer, which may be two or three years later. If you use a saponifiable oil, of course, you know there is a tendency to reaction there and discoloration in time which will become a serious factor and it may produce rancidity, which will also become disadvantageous.

President Olney—I don't wish to curtail this discussion, but I was simply going to suggest that we have the next paper by Dr. Richard B. Earle first, which may take up some of these phases that are being discussed. Then

This Photograph of the Fifth Annual Banquet Was Taken Immediately After the Guests H

we can discuss both papers together afterwards in further detail.

Dr. Earle!

Dr. Richard B. Earle—Mr. Chairman and Members of the Association: I think I am laboring under a double disadvantage this afternoon. In the first place, a good friend of mine now in the rear of the room assured me he hoped I would cut it as short as possible. Secondly, Mr. Hinckley has said a great deal that I will have to go over again, I imagine.

. . . Dr. Earle then presented his prepared paper:

Some Phases of Cotton Oiling Process and Its Relation to Finishing

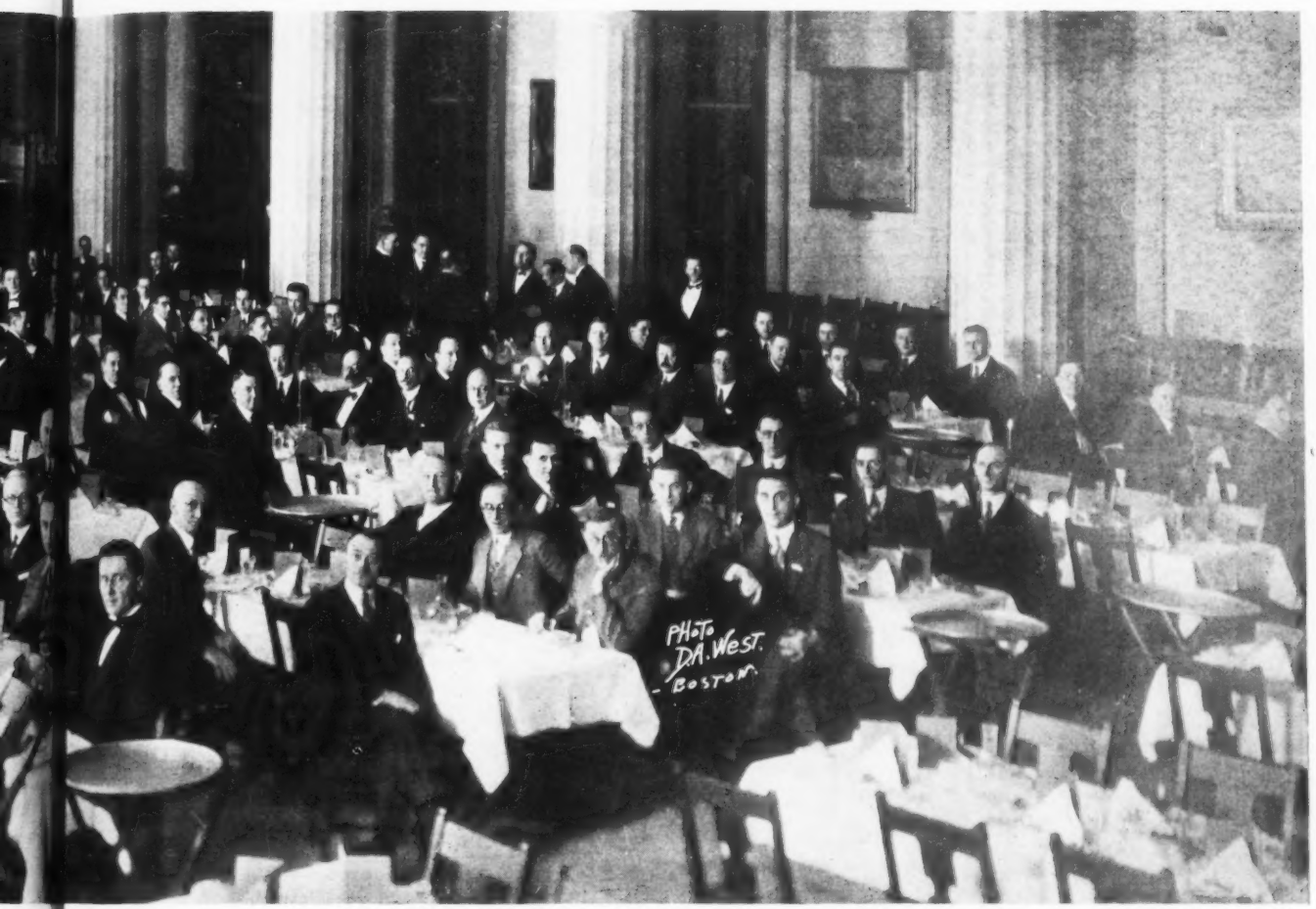
By Dr. Richard B. Earle

The process of oiling raw cotton fiber was first brought to my attention by a Southern mill, sulphur dyeing gray goods. It was felt that the introduction of mineral oil into cotton fiber before spinning was bound to cause unevenness in the dyeing, because of the non-removal of oil present, owing to omission of the usual kier boil. From the finisher's point of view there are two main angles to the oiling process:

1. Has it come to stay?
2. What effect does this have on the subsequent dyeing and finishing?

First, in regard to the oiling itself. In American Wool & Cotton Reporter for March 26, 1925, there is an account of a discussion in regard to the process at a meeting of textile operating executives of Georgia, and in the same journal for April 30, 1925, a discussion by the Weavers' Division of the Southern Textile Association. I have discussed this process with several people who have seen it in operation.

In brief, the process consists of spraying a mineral oil, or a solution of an emulsified mineral oil, on the raw cot-



ests Invited. Most of the Vacant Tables in the Picture Were Filled Shortly Afterward by Late Arrivals.

ton in the hopper of the opener. The spraying is automatically regulated so that it is done as evenly as possible, using not over 1 per cent of oil on the weight of the cotton. From the opener the cotton passes through the usual processes of carding and spinning.

At the Georgia meeting it developed that while this process had been in use in several mills for some time (it was stated to be about two years old), it was entirely a new thing to many of the mills, so that, measuring by extent of usage, the process may be said to be still in its infancy. The oiling of wool has been in use almost from time immemorial, and it is now spreading into the cotton game.

It is claimed that this oiling not only aids the spinner but actually makes an improvement in his finished yarn. The following aids to the spinner seem in general to be not only claimed but generally true, as was shown by the testimony of mill executives who were not at all interested in any process unless it was of direct benefit to their mills. It is claimed that it makes the fibers lay parallel easier, cuts static, lessens dust and fly in the rooms, wastes are easier to handle, the fiber runs better and draws better, there is less breakage in the slubbers, does not interfere in any way with cleaning the pickers, more cotton is gained from the pickers, and tensile strength increases three to four pounds. Most of these claims, as I said, I believe to be true. Some mill executives vigorously deny there is any increase in breaking strength; if not, there are enough reasons left for recommending the process. It seems to have been shown that unless over 1 per cent of oil is used there is no danger of gumming up the cards. Several mills in Georgia have been using the process for a year and a half or longer. I am told that some mills abandoned it where they are using long staple cotton for finer goods. .

That is not strictly true, because I know of one mill that used the process and gave it up, but that was for a different reason. The mill was using an extremely long

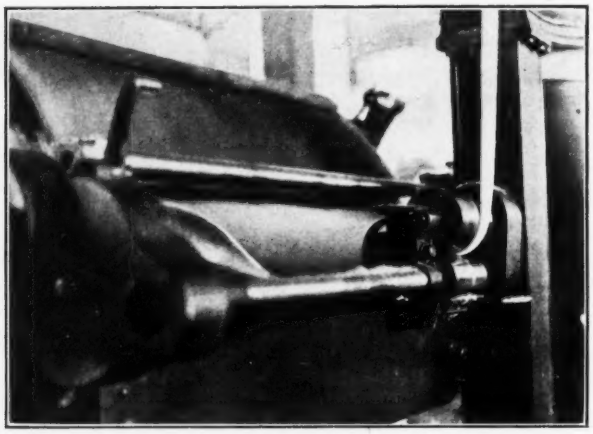


FIG. 1.—*Showing Cotton Lint Collected Where Oil Is Not Used*

staple cotton and they felt that they didn't gain enough cotton to pay for the cost of the process.

I think, when there are so many demonstrated advantages to the cotton manufacturer, that unless it can be shown that there are counterbalancing disadvantages, the process *has* come to stay.

Now, in regard to the dyer's and finisher's point of view, chiefly the former. We may bring up three main processes of dyeing cotton:

1. Raw stock dyeing.
3. Gray cloth dyeing.
2. Bleached cloth dyeing.

From the dyer's point it is essential that even dyeing can be secured from the cotton It is a well-known fact that the presence of oil on cotton fiber causes the cloth to dye a deeper shade If there is any inequality of distribution of oil on the fibers the dyeings are bound to be uneven.

In the case of raw stock dyeing, it is not essential that the oil spraying be perfectly even, because when the fibers are carded and spun into yarn they are bound to be so mixed that any irregularities in oiling are evened up. One gets increased depth of color and somewhat better penetration than with untreated fibers. In some plants mineral oil emulsions are added to dye baths for padding, as a standard practice.

In the case of kier boiled cloth, no trouble needs to be apprehended if a good grade of mineral oil has been used in spraying. By a good grade I mean one which will emulsify easily enough to be removable, or at least evenly distributed, under the conditions of the boil.

Most of the discussion in regard to the dyer's point of view on the spraying process has arisen around the third method of dyeing—gray cloth dyeing. This is an old practice, and is usually carried out, in the case of sulphur dyes, by preparing the cloth by singeing, Diastaforing, washing and drying. The success of such dyeing with gray cloth from oiled cotton depends on several factors: ease of removability of the oil by plain washing, the amount present, and the evenness of its distribution. Several grades of spray oil are on the market possessing quite widely differing speeds of emulsifiability. It would seem probable that the oil which emulsifies easiest with water is the best to use.

The amount of oil present on the fiber depends on the kind of oil used, as with an easily emulsifiable oil we could spray with an emulsion of the oil, thus using less actual oil. With a straight oil spray not over 1 per cent on the weight of the cotton is used.

In regard to evenness of distribution: In the early attempts the cotton was sprayed from single-acting pumps, giving a very uneven distribution. The process has been much improved, so that at present the oil is very evenly distributed on the cotton.

The facts in regard to results on using such oiled cloth for sulphur dyeing in the gray are about as follows. I have heard of at least three complaints from plants following this practice, but none of these three are of recent origin. One plant chemist in particular, with whom I have talked, has been very apprehensive of trouble and has watched the results carefully and has seen no trouble whatever.

Three months ago I felt that this process was dangerous for the dyer. I have completely changed my point of view.

In another case where the goods showed unevenness it is not certain that oiled fiber was used in weaving the cloth. Personally I have been afraid of difficulty with the practice from the first. I have not been able to get

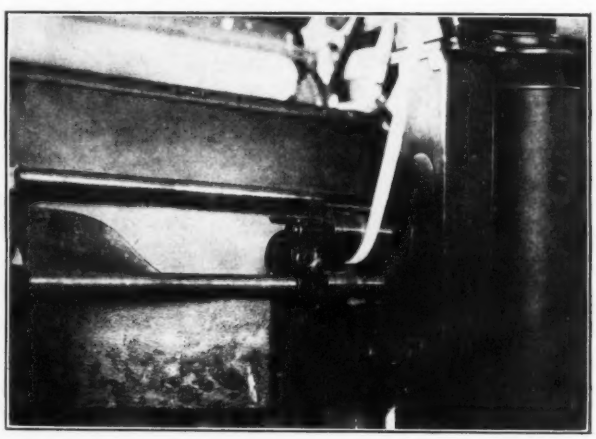


FIG. 2.—*Showing How Clear Card Is Left When Oil Is Added*

samples of uneven dyeing which show the supposed bad effects. I have samples here of two sulphur dyed pieces of cloth, both from the same gray mill, one of them dyed before the oiling process was used and the other dyed after the oiling process was used. Personally, I can't see enough difference between them to argue about it one way or the other, particularly as these, naturally, were not dyed at the same time, or anything like it. Anyone here who has had experience with machine or sulphur dyeing knows that results will vary. I must conclude, therefore, that the harmful effects are exaggerated.

In conclusion, I believe:

1. The spraying of cotton fiber in the opener has been shown to possess many advantages for spinning.
2. The process has come to stay.
3. The amount of oil added is so small, and so evenly distributed, that its use is no disadvantage to the dyer and finisher.

In closing, I will say that I think any one of these remarks can be criticized, but all I could do was to give you my own personal opinion, and I have put a good deal of thought into this thing for the last six months. Personally, I don't believe there is any danger to be apprehended from the practice. (Applause.)

Further Discussion of the Cotton Oiling Process

President Olney—We can spend five minutes on the discussion of these papers.

J. J. Sokolinski—I would like to ask Mr. Hinckley a question. He said that the vegetable oil would have a tendency to recover more than the mineral oil. But isn't it true that if you kier boil with a vegetable oil you would have a cleaner stock, particularly at the time when you use the caustic? You would have a tendency to form a soap—that is, very little of it—and you would have a cleaner stock mixed with the oil than you would have with the use of the mineral oil.

Mr. Hinckley—That would, of course, depend on surface. There are certain kinds of mineral oil that you can't reduce and there are other kinds that you can. The only answer I can give to that question is that the oil must be completely emulsifiable.

Mr. Sokolinski—I don't mean a stain. I mean, when you have a vegetable oil you would have a cleaner stock than you would have with mineral oil. If you use a mineral oil you only emulsify and take it off; if you use a vegetable oil you would saponify and thereby have an extra turgent action by turning that vegetable oil into a sort of soap.

Mr. Hinckley—I can see the point you are trying to make, but experience doesn't bear that out. I was hoping that somebody would have something to say distinctly along those lines. Of course, if you take my word for it, it will be a little bit one-sided. We have gone into that thing and there is absolutely nothing to it. It is my opinion, based on a great many tests, that emulsifying is the practical way to clean cotton. Saponification is not the best way, although we have a combination of those two actions. But the nearer you can get to perfect emulsion in cleaning the more you can carry your foreign matter away with less action upon the cotton fiber.

Dr. Earle—I would like to remark that I want to agree with Mr. Hinckley again when he says that emulsification is the only way to clean cotton. It *is* the only way to clean cotton.

I have here two samples of sulphur dyed cloth dyed in a Southern mill. "A" was sulphur dyed on unoiled cloth, "B" dyed on the same cloth after the oiling process had been used. The shade, of course, is different. They were oiled at different times, but I can't see any great difference between them.

I also have a sample of oiled gray, through the kindness of Mr. Hinckley, which perhaps some of you may like to see.

H. C. Roberts—Mr. Chairman, I would like to ask the speakers if they think there is any appreciable difference in oil dyed cotton and unoiled dyed cotton, provided they are dyed from the gray without any special boiling-out process to remove the saponified oil. That is, would the oiled stock dye any heavier than the unoiled goods, or vice versa?

Dr. Earle—The oiled stock will dye heavier; it will get better penetration. You get better money value out of the dye—that is my opinion. You get the same effect that you get when you put emulsifiable oils in the bath. Even emulsified mineral oils are put in to increase penetration. You get the same effect here.

Mr. Roberts—If you had two pieces of cloth that came from different sources, that were dyed at the same time, one of which was heavier than the other, do you think the dyer could say that it was most undoubtedly due to one stock being oiled with a different type of oil than the other stock?

Dr. Earle—I think too many factors enter into that question. I should think I would want to see the particular piece of cloth, also to know how much the dyer was hunting for an alibi, and several other things.

Mr. Roberts—I think all dyers are hunting for alibis. (Laughter.)

Dr. Earle—Of course, everybody is more or less hunting for alibis. But, in general, it will strengthen the shades, particularly with sulphur dyes.

J. J. Sokolinski—With reference to these samples, the sample that has been oiled and the sample that hasn't been oiled, if the oil and emulsification increase its cleanliness, shouldn't that result in a better shade?

Dr. Earle—I imagine so. The few treatments that you would give a dyeing in the gray wouldn't get all the oil out; there would be enough in there probably to deepen the shade and increase the penetration.

Mr. Sokolinski—With the oil in?

Dr. Earle—Yes. The difference in shade in those two pieces, of course, has nothing to do with it, because they were dyed at entirely different times. The only thing I can say about them is that they are from the same mill and dyed in the same way.

A. K. Hobby—It is not quite clear to me whether you attempt to remove the oil before dyeing or whether it is deliberately left in during the dyeing process.

Dr. Earle—In the ordinary process of gray cloth dyeing, after Diastoforing, it gets a plain, simple wash which doesn't amount to anything, so that the greater part of the oil is left in.

President Olney—If there are no further questions we will proceed to the next paper, "The Dyeing of Viscose Rayon with Mordant Dyes." It was first intended that this paper should be presented by Winthrop C. Durfee, but it is going to be presented instead by his son, Walter C. Durfee, so the program is right in either case. Mr. Durfee!

Walter C. Durfee—Gentlemen, in either case we are going to give the credit to Winthrop C. Durfee for making the mordant and getting the paper here, and so forth.

Before starting on this paper I will tell you what it is all about. It is confined to the dyeing of viscose type only. We have dyed some other types, but we are not going to talk about them. This [indicating] is the sort of material that we worked on. The colors that we have actually prepared for the lecture are this yellow here, which is an Alizarine Yellow 2G, Calco Chemical Company; this one here is a Chrome Red A4B from the Newport Chemical Company; the next one is an Erio Chrome Azurole B, from Geigy. I will have to apologize if they are not dyed right and to the satisfaction of those companies.

. . . Mr. Durfee then presented his prepared paper:

Dyeing of Viscose Rayon with Mordant Dyes

By Winthrop C. Durfee

The *study* of coloring viscose rayon with mordant dyes is of importance as adding to the *resources* of the dyer a wide range of colors that have qualities of special value.

This process is *simple* and obviates many of the difficulties of application of the vat, sulphur and developed dyes. Perhaps we have our own difficulties. In the field occupied by direct colors it furnishes a range of colors that have high degree of fastness especially to soap and water. Perhaps the most striking feature of mordant dyes as applied to viscose is the evenness with which both cotton and viscose can be dyed together in the same bath to practically a uniform shade. The explanation for this is that the mordant dyes present a probable advantage in that most of them have little or no affinity for either cotton fiber or of viscose, and if the mordant can be absorbed with a fair degree of evenness the evenness of dyeing will depend upon the fixing power of the mordant on the color rather than the nature of the viscose itself. Many of the samples of cotton and viscose that we have dyed together have dyed closely alike on both fibers.

This statement of even dyeing of viscose and cotton applies only to actual fact. We do not pretend that all grades of cotton and viscose will act the same as those which we have seen.

In regard to the dyeing of different batches of viscose, we have had no experience. We have dyed some that we supposed to be different; we have dyed samples said to be Tubize rayon and we have dyed cotton; and they all come out about alike. We think probably different batches of viscose may come out alike, but we have not made any tests along that line. We believe that other types of viscose having a different diameter of fiber and other types of cotton differently prepared will dye differently.

There is little to be said to experienced dyers and related chemists as to the application of mordants to cotton and related fibers. We wish to call their attention to the samples shown here. These samples have been done with a chromium mordant of our own manufacture which at present we are calling "viscose mordant." This viscose was mordanted at 140 deg. Fahr. for about forty minutes and rinsed well. It was dyed soon afterwards at about 175 deg. Fahr. for about one and one-quarter hours.

The samples that are shown are of colors that are lake forming (distinctly mordant colors) and have been selected as types to illustrate the results.

As is evident, the dyeings are in full shade and the silk is in good condition. The dye baths were carried out with sufficient water for ease of handling in case of yarns or circulating in case of machine dyeing. The dye temperatures were kept below 180 deg. Fahr.

The viscose mordant here spoken of applies to several types of rayon, but does not act similarly on the cellulose acetate type of rayon.

To summarize what has been said, we believe that the dyer or the chemist or the dye salesman who turns his attention to the use of mordant dyes on viscose rayon will find himself in possession of additional resources to meet the requirements of his work.

President Olney—Have you any questions to ask Mr. Durfee?

E. F. L. Lotte—Mr. Chairman, I would like to ask

Mr. Durfee whether that skein was done by hand or machine dyeing?

Mr. Durfee—This skein was done by a laboratory boy, the first time he happened to have handled that particular skein.

Mr. Lotte—I understood you to say hand or machine dyeing.

Mr. Durfee—I said in the paper that the quantity of water used was suitable for dyeing either by machine or by hand, or practically in any other way.

Mr. Lotte—What I meant to ask was, if you are willing to answer the question, what form of machine do you use for the skein?

Mr. Durfee—That particular skein is a laboratory dyeing done in a pot of water, with a glass rod to stir the fiber.

Mr. Lotte—You have had no experience, then, with mordant dyes on machine?

Mr. Durfee—No; this lecture is confined exclusively to laboratory dyeing of these skeins.

Mr. Lotte—What I was interested in knowing was what machine you use in mordant dyeing that can work it sufficiently to mordant it so that any dyer would still be able to wind it.

Mr. Durfee—In answer to that question, I have made careful inquiries into that and I find that it is quite customary in some dyeing processes to give two or three more handlings. In the case of developed colors, I am told that everything has to be washed after it is used, and there are more things to use.

Mr. Lotte—In developed colors, have you been successful in, say, 150 denier? I appreciate it has been successful in artificial silk in twists, but if you dye 100 or 150 denier, diazotize, and develop, are you still able to wind them?

Mr. Durfee—I couldn't say. We don't wish to imply that we can only dye skeins, because we simply showed them for convenience in displaying the colors. I anticipate that knitted goods and all such fabrics will dye just the same in the chemical sense.

Mr. Lotte—We are quite interested as commission dyers in being able to deliver the goods to the man who winds, and I notice that other people have the same problem, because a speaker earlier in the day mentioned that cotton laces were better than silk laces—and I thought he was right. I wanted to get Mr. Durfee's opinion on this point, because if he had a machine that could dye mordanted colors on 100 or 150 denier viscose, that would be quite an interesting machine, I am sure, to more than a few of us.

Mr. Durfee—All we can say is that the temperatures are very low and the dye baths are very quiet. There is no need to agitate them severely. I noticed no trouble in these laboratory dyeings. I can't go further than that.

President Olney—Mr. Durfee is quite anxious for me to say that this was really prepared at my request, and was worked out partly for that purpose.

Are there any further questions? If not, we will pass to the next paper, "The Dyeing of Silk White Effects upon Woolens and Worsteds," by Alan A. Claflin. Mr. Claflin!

The Dyeing of Silk White Effects on Woolens and Worsteds

By Alan A. Claflin

I feel that you are more anxious to have me give you some information about the tickets for the dinner tonight, concerning which, presumably, I know something, than to say anything about the dyeing of silk white effects, in connection with which the reverse may be true.

. . . Mr. Claflin then made an announcement with reference to the banquet tickets. . . .

As it is so late, I will summarize my work on silk white dyeings very briefly. I might go into the history of silk whites, but I assure you that would be largely imaginary.

The silk white process, like Topsy, has largely "just growed," and the processes that are used are primarily empirical. Because these processes are empirical, certain abuses have crept in which would not have occurred if the process had been devised in its original form, as it is at present used.

The process probably had its origin in the use of resist dyed yarns, when they found they could get a two-color effect on piece goods. Then with the introduction of the acid Alizarine colors it was found that some of them had an affinity for wool which they didn't have for silk. It was further observed that the greater the acidity of the bath, the less the affinity for the silk; in other words, we got our silk whites with an increasing amount of acid. On the other hand, the class of colors which gave this effect were found to be those colors which had a tendency to go on uneven if there was too high acidity in the bath.

The customary practice is to add the acid in several portions, and as they use acetic acid in the first instance, for the purpose of getting level results, why then, to increase the acidity they keep adding more. So that in practice you find that they are using twenty, thirty, forty and even fifty per cent of acetic acid in the dye bath.

One who considers the dissociation of acetic acid realizes that so far as chemical action is concerned, there is no more available acidity in 50 per cent acetic acid in the dye bath (as 50 per cent is based on the weight of the goods, of course) than there is in 20 per cent; in fact, very much smaller percentages give you the maximum of hydrogen ion concentration, which is the real effective agent. Therefore, it seems as though it would be better to have some acid which will give a higher hydrogen ion concentration.

The natural proposition would be to use sulphuric acid after the first bath, but the amount of sulphuric acid would be added to fulfill its theoretical requirements and would be so small that it wouldn't be practical. Instead of adding one-third of a per cent of sulphuric acid, it is simpler to add, say, one per cent of oxalic acid.

So in dyeing silk white effects, our experience has been that if you start the bath with five or ten per cent of acetic acid, then for the sake of clearing up the whites add one per cent of oxalic acid, and then at the end of fifteen minutes another per cent, then at the end of fifteen minutes more another per cent, instead of adding ten per cent of acetic acid, you will not only get whiter silk effects, but you will also save considerable money.

I have a few dyed samples which I might distribute to you to show this result, but the last time I distributed samples at this meeting I didn't get them back (laughter) and that tied up the United States Government very much with their experiments on khaki. If anybody is particularly interested, I will show them the few samples that I have. But I would suggest that they simply try to use one per cent of oxalic acid instead of ten per cent acetic acid in any successive acid additions that they make to the silk bath.

I think that is all I need say just now. Thank you. (Applause.)

Discussion on Dyeing Silk White Effects

President Olney—Have you any questions to ask Mr. Claflin, or any remarks you wish to make on this particular subject?

H. R. Davies—I would like to ask what effect that one, two, three per cent of oxalic acid has on the subsequent chroming.

Mr. Claflin—I don't think that it has any particular effect there at all on the subsequent chroming. The addition of the oxalic acid applies equally well whether the silk white effect is in acid dyeing or on the chalk chrome colors. When we used the chalk chrome, we added the usual percentage of chrome with acetic acid again in the second bath, and then for certain colors we added lactic acid to check the effect of overchroming which you get on many of the chroming baths.

W. L. Sjostrom—What effect would tartar have?

Mr. Claflin—It would have the same effect as lactic acid in preventing overchroming. Any reducing agent can be used to prevent overchroming in the second bath.

President Olney—There is one question I would like to ask Mr. Claflin and that is: What time is the banquet to start to-night?

Mr. Claflin—It is announced as 6.30 on the program. When it will actually come off, you will probably be able to tell better at 6.30.

President Olney—Are there any other matters to be brought before the Association? Are there any further questions?

In bringing this meeting to a close, I would like to say that in the four years' experience of this Association, this is the first time we have covered every paper that appeared on our program. That is quite a source of satisfaction to me because in previous years we printed subjects with the full assurance that they would be presented and when the time arrived, there seemed to be no one here to present the paper, or the paper had not been sent in. So in that respect I think we can look upon this meeting as being quite successful.

We will now adjourn until the banquet to-night.

. . . The meeting adjourned at 5.20 P. M. . . .

FIFTH ANNUAL BANQUET

Saturday Evening, December 5, 1925

The Fifth Annual Banquet of the American Association of Textile Chemists and Colorists was held in the dining hall of the Walker Memorial, Massachusetts Institute of Technology, Cambridge, Mass. It brought to a successful and impressive close the Fifth Annual Meeting of the Association.

Present at the banquet were many men known throughout the American textile and dyestuff industries and several noted men of science. Among the after-dinner speakers were Dr. E. B. Millard, Professor of Physical Chemistry, Massachusetts Institute of Technology; Fraser Moffat, President of the Tanners' Council; Dr. Grinnell Jones, Professor of Industrial Chemistry, Harvard University; Franklin W. Hobbs, Vice-President of the National Association of Wool Manufacturers, and Dr. Edwin E. Slosson, author of "Creative Chemistry."

Following is the report of the Fifth Annual Banquet. It opens with the introduction by John F. Bannan of the Toastmaster, Alan A. Claflin.

John F. Bannan—On behalf of the members of the American Association of Textile Chemists and Colorists, as Chairman of the Northern New England Section, I am quite sure you will agree with me that this meeting has been satisfactory in every respect. In order to make it a complete success I have appointed as Toastmaster for the evening Alan A. Claflin. (Applause.)

Toastmaster Claflin—Guests and Fellow Members of the American Association of Textile Chemists and Colorists: I am sorry that the duty of acting as Toastmaster has devolved upon me, as I thought I had "passed the buck"; but as I was instructed not to begin my remarks with an apology, I will just say that we have with us this evening one of the greatest expounders of the doctrine of relativity, and I am putting up to Dr. Slosson the problem as to whether having a rotten toastmaster does not make

the speakers of the evening appear pretty good under most any circumstances. (Laughter.)

We had hoped to have with us this evening Dr. Stratton, President of the Institute, but at the last moment Dr. Stratton, because of ill-health, was unable to be present. However, Dr. Stratton did not intend to speak, so that I assure you gentlemen who have looked at the rather imposing list of speakers and guests upon our program that all the speakers are here. It is only the inarticulate guests who are absent. (Laughter.)

Not so many years ago the Latin motto *"Caveat emptor,"* or, in ordinary English, "Let the buyer beware," was the governing principle on which the retail store operated. Now dyestuff firms only operate on that basis. (Laughter.)

However, I believe my mill friends will join with me in agreeing that the stiffest examination the mill product has to meet is that of the chemist employed by the large merchandiser, to make certain that there is no misrepresentation on his part as to the quality or standard of the goods which he sells.

We have with us this evening as our guest a gentleman who has acted as chemist for one of the greatest retail houses in the world, William Filene's Sons Company, and I have great pleasure in introducing to you Dr E. B. Millard, Professor of Physical Chemistry at the Massachusetts Institute of Technology, who will speak to you briefly about his experience in testing textile fabrics in the interest of the public.

Professor Millard! (Applause.)

Dr. E. B. Millard—Mr. Chairman, Members and Guests of the Association: I shall rather enjoy telling you for about five minutes of the experience with our little laboratory. It was put in about six years ago by a store with an open mind regarding what a laboratory could do. They laid out no program as to what should be accomplished. They merely said: "Put in the laboratory and let us see whether with that we can improve the quality of our merchandise."

Accordingly, in a very obscure part of the roof, suitable space was obtained where a chemist could make the fuss and dirt and smell which he enjoys so thoroughly; a moderate amount of equipment was accumulated, and all the members of the staff in this store were informed that there was a laboratory on the roof. No person in that organization has ever been instructed to use the laboratory unless he saw fit, until some mistake of his had shown him that he must go there.

The buyer still proceeds to buy merchandise in the way that he has always bought it; that is, he uses his judgment, his knowledge of resources, and, of course, he considers the price factor; and when his merchandise comes into the store it is merchandise that he selected because he wanted it.

In contrast to the laboratory at such places as Sears, Roebuck & Co., there is no authority back of the laboratory. We cannot say to a man, "This is below standard," or, "This is not suitable for the purpose which you have in mind." He may buy it if he likes. When he gets ready to advertise it, he writes up his advertising copy, and the manuscript for that advertising is placed in front of a staff which consists of a few executives and a great many shoppers. Some shopper goes into the department and buys, or at least borrows, the merchandise which is to be advertised, and then it is tested in the laboratory before it is advertised.

If a buyer wishes to sell something and say nothing except that it costs 60 cents, we don't have to test that merchandise. But if he says it is all wool, or if he says that it is guaranteed to be all silk, or if he says anything about it which can possibly be tested in a laboratory, then that material comes to the laboratory for the tests that we can make upon it. If the merchandise is not as his advertising says it is, then he cannot advertise it. It happens many times that the merchandise is exactly as the buyer thought it was. The number of cases of misrepresentation is very small, but they still think it is worth while to keep a laboratory to guard against those few cases.

After the merchandise has been put into stock, if a buyer reorders the laboratory has no way of knowing that. Occasionally the material is bought by a shopper who is unknown to the man who runs the department, and tested, and if that merchandise falls below what he claimed for it when he advertised it, he is called before the proper executive to explain why he is misrepresenting his merchandise. He doesn't have to have the second lot or a redelivery tested, but he may if he wants to. It is not charged against his department in case he does. He pays his full share of the expense of running the laboratory, whether he uses it or not.

We have, of course, had rather interesting cases of supposed failure of a fabric to stand to some guarantee which an overzealous salesgirl made with regard to it. We occasionally get a claim for adjustment following the sale of a rather low-grade party gown about which the salesgirl said, "Oh, yes, you can have it dry-cleaned. You might even have it washed if you like." Well, after she "likes" to have it washed she generally brings it back, and then the garment comes to the laboratory. Remember, we may have no other gown like it; there may not be another one in stock. The buyer asks the question, "Is this the original color?" Well, I don't know how to tell whether it is the original color unless I can see some of the original that went with it. But the fact that the person who buys the garment says it has faded is usually ground for suspecting that it has. Our only recourse,

however, is to try to fade it again or to wash it again and see if we can get more dye out of it.

In the course of thirty days of ordinary merchandising we handle from 1,500 to 2,000 tests in that laboratory of the merchandise going through a single retail store. Ninety-five per cent of that material is sent to us with less than six hours at our disposal in which to get a report out. So you can see we have to take what might be called chances.

In a good many cases the tests are made upon garments which would not justify the expense of ruining the garment, and we have to search for a little scrap that the trimmer missed. Tests which according to the instructions in a book might take a certain size sample, we are performing daily with less accuracy upon very much smaller samples. Practically every test that comes through the laboratory is what we call "rush," and the rush work is so common that the daily sheet in the laboratory has the word "Rush" printed upon it to satisfy the man who brings it in, and in the rare case when he isn't in a rush we cross the word out. It is much simpler to do that than to have to write down the word "Rush" fifteen hundred times a month.

Still, of those 1,500 tests that we run, practically all of them which find unsatisfactory merchandise can be traced to the improper use of material for a purpose for which it was never intended. The time when the retail buyer didn't stand a fair show is definitely gone, I think. If you could see the trouble that a salesgirl has in disposing of a wash dress, which might retail for two dollars and a half, which she cannot guarantee will stand washing in the worst roughneck laundry that was ever run, and repeated washings, you would know that the time for fast dyes has come. The man who can deliver those things is the man who is getting the business. I don't know who makes them, but I do know that ninety-nine times out of one hundred we get them; so that the Latin motto no longer applies, because the retail buyer now does get a chance. (Applause.)

Toastmaster Claflin—In connection with our Association, probably no one word has been more iterated and reiterated in your ear than that much abused word "research." Indeed, one might say that the fundamental and primary object of this Association is the direction of chemical research for the benefit of the textile industry. We have, as you know, made only a beginning in that direction, and lest we become satisfied with that beginning and lapse into a coma of self-satisfaction and consider how well we have done, it seems well that we should hear what a sister industry has done.

As the spokesman for that industry, your Committee has invited here to-night not one of the chemists who is doing the work, nor even the distinguished chemist who is directing the work, but the hard-headed executive, the cold-blooded financier, the practical tanner, a man who is in business himself and as such must go out among his fellow business men and get the money to support that research.

Fraser Moffat, of New York City, the President of the Tanners' Council of America, is with us to-night, and I am going to ask Mr. Moffat to tell us why he got the money for chemical research, how he got the money for chemical research, and whether he is glad he did it.

Mr. Moffat! (Applause.)

Fraser Moffat—Mr. President, Mr. Chairman and Gentlemen of the Association with the long name (laughter)—let me read it: "The American Association of Textile Chemists and Colorists": It is a great relief for me to be able once again to stand up and call somebody else names.

Mr. Claflin has taken an extraordinarily unfair advantage of me, a very simple and diffident layman, in this congregation of august scientists.

I have been pestered half to death and my dinner has been partially destroyed by my associate on my right, Professor Jones of Harvard, and my associate on my left, Dr. Slosson of Washington, who have been insisting upon discussing with me a very uncomfortable subject. They call it synthetic leather. (Laughter.) I don't know anything about synthetic leather, and I have been endeavoring to assure Dr. Slosson and Professor Jones that there isn't any such thing.

And now along comes this scientist from William Filene's Sons, a graduate of the great department store of Boston, who in this center of light and learning assures me that when we tanners want to send to Filene a few pairs of shoes (which are inevitably subject to the Pure Food Act, promulgated in Washington) we have got to go up against the chemist who performs 1,500 operations in thirty days and assure him that we have "the goods." (Laughter.)

As a pure, ordinary business man, I ask you, "Where do I get off?"

Mr. Claflin sets me the task now of telling you what and why, and all the rest of it, we started our very simple research laboratory. You can see at once the dilemma in which I find myself. But Boston, fortunately, is an old stamping-ground of mine. I am not a stranger here, and I am going to speak with a reasonable degree of freedom in the presence of these textile chemists and colorists—which is an extraordinary name. (Laughter.)

First, I want to say something about this old leather business of ours. You may be interested to know that last year the production in this country took the overcoats off of 23,000,000 full-sized cattle, and we went further and operated upon 17,000,000 calves. That wasn't enough, so we went after 36,000,000 goats from all over the world and added to that the various hides and skins which we

took from kangaroos and horses and pigs and sheep and lambs, to the amount of 45,000,000.

We are a billion-dollar business, we and our products, and sometimes we go well beyond the billion-dollar mark. But of this vast amount of material, about 80 per cent goes into these shoes which William Filene & Sons are so careful to have their customers wear. I don't know whether they guarantee a fit or not, or whether the customer gets the fit. (Laughter.)

Beyond shoes, this vast amount of raw material goes into belting—that is, industrial service; into upholstery; into articles for adornment and personal wear; and altogether the story of our raw material is a most fascinating one. We stretch all over the world, paticularly into the uncivilized parts, for as civilization goes on so hides become a little scarcer. The original clothing of man was developed from a highly civilized condition, as you know.

The honest admiration of the world market is expressed precisely in this cross-examination that I have been undergoing by these two distinguished scientists in their endeavor to develop some sort of a synthetic compound that they might be able to call leather. Everyone has an admiration for this wonderful material, and therefore they all try to imitate it, and they all try to call it odd names. Almost invariably the name is found to be "imitation leather," or something of that sort, and we regard that as the sincerest flattery.

Seriously, however, these synthetic efforts have pretty generally come to naught.

As I pointed out to Professor Jones, when you chemists press us too hard we fall back on the proposition that our raw material is a by-product of another industry, and when its value for the purpose to which we are putting it sinks below a certain mark your synthetic compound at once becomes valueless and we go on and scoop up the business; which is, after all, our main intention. (Laughter.)

You want to know something about this research of ours. From the time of the earliest Pharaohs, leather has been synonymous with all degrees of civilization, and the manufacture of leather through all these centuries has largely been a matter of empiricism. Yet, great and distinguished chemists have dabbled in this question of leather, men whose names would probably mean more to you than they do to me, but whose records we know; Lavoisier, Berzelius, Liebig and Emil Fisher have all dabbled a little, endeavoring to find out something about this mysterious business.

About fifty years ago the greatest stride in the manufacture of leather was made in the introduction of what is known as mineral tannage. That really was the high mark of science in the leather business. Since then there have been no important scientific developments, but there has been a constant progress toward finding out something as to what the qualities of our raw material are.

Remember that the supply is variable. It comes on in a great flood. We cannot control it. Therefore, our first duty toward it is conservation, and after we have conserved it properly we must then attack the methods by which it is made suitable for the world's population, in an endeavor to create a finished product which shall be sufficiently cheap that the wealth of the world can buy all the leather of the world, and we at once become entangled upon an economic problem as well as our conservation problem, which is a purely scientific one.

About twenty years ago some men of wide vision and great daring in the leather business raised a very modest fund and suggested that we put it up for a research laboratory. Well, really, at that time we didn't know the meaning of research; but they thought it sounded well, and they had forty or fifty thousand dollars and they had a good many things they would have liked to do, so naturally they started.

Research—that word is not outworn, but it gets tiresome sometimes. A very simple definition of research, as I see it, is the study of our industry in order that we may find out how to do something a little better than we ever did it before. Gentlemen, that is industrial research.

We started with a room and a wash boy and a chemist, and we didn't get very far. Then came the war, and we found that we had a lot of work for that laboratory, but it wasn't research. After the war, the leather business faced a pretty serious situation. But we had stowed away, carefully secreted from the Government and from hungry hands, about $200,000 which we tanners had industriously collected from the manufacturers of shoes and other things. We had sequestrated—that is a fine word—that money, and there was likely to be a good deal of a fight among the tanners for a share of it.

At about that time, owing to a most fortuitous combination of circumstances, I was asked to give this leather business a little attention, and I found that this matter of research was the one thing that would pull us all together.

We took half of that money—and, of course, we took the major half; you always do that when you start out to erect a building, because if you say you are going to spend $100,000 on it, it will be $150,000 before you get through. At any rate, we decided that we would take half of that money and put in a research laboratory at the University of Cincinnati. In this presence, I speak of that with great hesitancy, because we considered Boston Tech and we considered Columbia University and the University of Chicago, and a whole host of others. We decided to go to the University of Cincinnati because, first, we got the atmosphere; second, we were assured of permanency; third, we received a very warm welcome;

fourth, we got the type of men that we wanted to get started.

We took our money and built our building, and we built it around a man. That may seem a little bit strange; but as I came in here to-night I was accosted by a very delightful man who told me that he came from Canada and originally from the "old country," and he was amazed at the beauty and dignity of this great building. I assured him that the building was merely the outlook and visible sign of the men who worked within its walls. After all, it is the man that is the essence; it is not the building, it is the spirit.

We tied up our enterprise to a man in whom we had confidence and who knew something about leather, and we started research on the fundamental structure of hides, about which no one knew anything. We have progressed slowly, but we are beginning to see light. We feel that the investment has been a good one. We believe that other industries will follow our example; in fact, one already has.

We believe in the tying up of industry to great institutions of learning. We believe that there must be that close touch if they are going to furnish us the men that we must have and if we are going to support them with the money that they must have. I am speaking in plain material terms.

So we put the laboratory at the University, and there it stands. Already we are getting results far beyond our anticipation. We are beginning now to anticipate making men who will be trained in the first three or four years in the humanities and technical service, and then given the finishing year under our direction.

Our foundation entails a considerable degree of co-operation with the University authorities, and I would like here and now to pay a tribute to that modest Western university and their broad-minded, generous attitude toward industry. It augurs well for the future.

I don't know whether I have answered all of Mr. Claflin's questions. In fact, I question very much if I should attempt it; but I want to say one thing more about this laboratory. First, its results are practical. That you may imagine because we couldn't put it there unless they were. But it has another reaction. Over the lintel we have written an imaginary suggestion that whoever goes in leaves all jealousies and competitive attitude behind. There we seek the truth, and the reaction upon the leather industry, strongly individual, intensely competitive, has been one of fine restoration of a battered and broken morale.

I think that that is one of the finest things to which we may point, and I would plead for the union of industry with educational institutions along that same line, very simply.

Our total budget is a very modest one. We in the leather business are poor. We are stricken with adversity, but we are coming back, and our great help is this knowledge that we are attempting to lead and not to follow blindly.

Over the entry way of that very modest Georgian building there is this tablet, which we put up with great pride, and I think it speaks well for the men whose vision and earnestness prompted it:

"For the advancement of science in industry and the progress of education, this building is given by the leather industry of the United States, a tribute to those of its members who served their country faithfully, and in memory of those who gave their lives in the Great War." (Applause.)

Toastmaster Claflin—I am sure you agree with me that we are indebted to Mr. Moffat and that the whole textile industry is indebted to Mr. Moffat for coming here this evening and telling us that their laboratory is leading them back to prosperity. It will be a happy day for the chemist when the textile industry looks to the chemist to lead it back to prosperity.

When we think of Cambridge, we naturally think of Harvard University, and when we think of Harvard we think that whatever Holy Cross did to them, whatever Dartmouth did to them, whatever Princeton did to them, that Brown and Yale did not do to them. (Laughter.) But if you have followed the daily papers you have doubtless observed that we must not give too much consideration to football. So as a representative of this great University I have not invited here one of the former coaches, nor one of the numerous volunteer coaches (laughter), but I have asked Prof. Grinnell Jones, of the Department of Industrial Chemistry, who certainly is no stranger to the textile industry on account of his work as Chemical Adviser to the United States Tariff Commission, to say a few words to us. I have great pleasure in introducing to you Professor Jones. (Applause.)

Dr. Grinnell Jones—Mr. Chairman and Gentlemen: It is my great privilege to bring greetings to you to-night from my colleagues in the Department of Chemistry of Harvard University.

You may perhaps have heard that many friends of our science have in recent years given us about $3,000,000 to advance the work in chemistry at Harvard. We are now busily engaged in drawing plans for a great new building. We hope to have the work of erecting that building started by next spring and within a couple of years we hope to be able to welcome you in our new laboratory.

It is also my privilege to-night to represent the United States Tariff Commission. The work of the Commission with which you are probably most familiar is our annual census of production and imports of dyestuffs. Although we have received a great many compliments from both producers of dyes and users of dyes as to the value and

usefulness of this pamphlet to them, we are still trying to make it better. For that purpose, Mr. Watson, the man on the staff of the Commission who is primarily responsible for this work, has for the past two months been visiting textile mills and discussing his problems with the textile chemists. Particularly, he has been trying to get data in regard to the cost of dyeing. We hope that as a result of the information which he has secured our next annual publication will be even more interesting and valuable to you than we have been able to make it in the past. At any rate, if you can offer any suggestions that will help us make it more useful we shall be very eager to have them.

To-night, on behalf of the Commission, I want to thank the officers of this Association and the many textile executives and textile chemists who have given us a great deal of help in this endeavor. (Applause.)

Toastmaster Claflin—In the forefront of all progressive movements in the textile industry, I am sure Franklin W. Hobbs, President of the Arlington Mills, Vice-President of the National Association of Wool Manufacturers, needs no introduction to you. We honor Franklin W. Hobbs as our counselor and our friend. We are grateful to have him here with us this evening. I do not know whether I tread on dangerous ground in asking Mr. Hobbs if it is permissible for him to say something about the present status of the Textile Alliance fund, which I believe the tax collector is now trying to get (laughter), and whether it is possible that any of this may be sequestrated for research in the textile industry. Mr. Hobbs! (Applause.)

Franklin W. Hobbs—Mr. Toastmaster and Gentlemen: I am delighted to be here, but I was under the impression that there were to be only two speakers, until the Toastmaster just referred to me. I hadn't the slightest idea he was going to call on me for any remarks.

I don't know exactly, Mr. Toastmaster, how to answer your question.

About a year or more ago the United States Revenue people suddenly levied a tax on the funds of the Textile Alliance that had been accumulated during the period of that body's active work, which would take practically the entire amount that under the agreement made with the Government was to be divided up. My recollection is that one-third of it was to be paid back to the United States Government for education and two-thirds to be distributed to the Alliance by a committee, of which I happened to be a member.

This sudden and unexpected action on the part of the Government tied up the whole situation, because the tax levied, I think, is a little bit in excess of the entire fund on hand. (Laughter.)

Very recently there was a hearing in Washington on the whole subject, at which time, I think, they finally realized that it was a non-profit enterprise, entirely and primarily for the industries, organized to bring in various merchandise during the war; and later, and secondarily, this money (which was really not a profit at all), the margin between what was charged for the merchandise they brought in and what the consumer paid for it, under an agreement with the United States Government was to be used for purposes of education. After several days in Washington, when this was discussed, they were at last made to see the situation in this light, and the Textile Alliance is now awaiting a decision. Until that decision is reached there can be no way of disposing of those funds, because if they were disposed of—I can say this without any reflection on this Association—it would be somewhat difficult to get them back, I am afraid, after they had been expended.

It has been a very great pleasure for me to be here and to hear the addresses you have had this evening. There was one thing that I was particularly interested in, with reference to the laboratory work of Professor Millard. He said that their greatest trouble came from the fact that people used merchandise for purposes for which merchandise was never intended. I think that remark covers practically all of the trials and tribulations of the textile manufacturers. The only customers we have any trouble with are those who don't know their own business, or who don't know what they are going to buy, or who buy the wrong merchandise for the purpose they are going to use it. If people did know what they wanted in the first place, and then bought that thing, I think our trials in manufacturing would be greatly reduced. I imagine those of you who are in the dyestuffs business, not only selling them but handling them, will agree with those sentiments. I think that strikes a very fundamental, a very tender subject with some of us.

As I say, it has been a great pleasure for me to be here. I can say only one further thing. Your Toastmaster referred to the fact that I was the Vice-President of the Woolen Association. I was very glad indeed to use my efforts (and it didn't take any particular effort) to have a contribution made to your research work by our Association. I have no doubt, as I told your President this evening, that that contribution will be continued, and I am glad to hear that you are doing such good work along those lines. (Applause.)

Toastmaster Claflin—Mr. Hobbs has confessed what we mean by valiant counselors. I wish we had more valiant counselors. Mr. Hobbs smiles very knowingly.

Chemistry has always been one of the mystic arts, a secret science. We are supposed to talk a language among ourselves not understandable to the ordinary mind. But in every generation there comes a great expositor of science, a man who is a great scientist himself and who has the gift of translating the mysteries of science to the

ordinary mind. Such a man was Michael Faraday; such a man was Thomas Huxley, and such a man is Dr. Edwin E. Slosson. I take great pleasure in presenting to you Dr. Edwin E. Slosson, author of "Creative Chemistry." (Applause.)

Dr. Edwin E. Slosson—Mr. Chairman and Gentlemen: Mr. Claflin, in inviting me here, made the suggestion that I come in on an early morning train so as to be able to attend one of your sessions and inhale the atmosphere. I attended this morning's session. The atmosphere was very remarkable indeed. As near as I could analyze it by inhalation, I think there was about 10 per cent of oxygen and 4 per cent of CO_2. The temperature was ninety-eight and six-tenths degrees; and as nearly as I could estimate the humidity, it was one hundred and twenty. (Laughter.) At least, I know it was over one hundred, because I had the extra twenty per cent deposited upon my brow. (Laughter.)

Besides the atmosphere, which Mr. Claflin offered as his own inducement, I got a great many ideas, and particularly some conception of the admirable research work which you are carrying on. My only qualification for dining with a body of experts of this sort in this business is that I have been myself in a humble way engaged for the last twenty-five years in earning a living by the coloration of cellulose; or, rather, by its discoloration. (Laughter.) I have been principally occupied in precipitating a dilute solution of ferric tannate upon these sheets of cellulose in an irregular linear design, thereby increasing the value of the sheets, or at least increasing their marketability, which is not the same thing as increasing their value, as every true salesman and many manufacturers understand. (Laughter.)

If I were unselfish and solely concerned with giving you the very best return for the valuable time that you are spending here to-night, I wouldn't say a word of my own; I would only read to you that very remarkable address by the Secretary of Commerce on the subject of research in industry which was delivered before the American Society of Mechanical Engineers on December 1. But I suppose you will not let me off so easily as that, even though it would be very much to your advantage, so I will merely quote one or two paragraphs from the address by Mr. Hoover, with a running commentary, such as a preacher uses when he is reading a chapter of the Bible, in the old-fashioned style.

It is very remarkable—indeed, a very lucky thing, I may say—for the country to have in an executive political administrative position a trained and successful engineer in charge of such great research establishments as the Bureau of Standards and the Bureau of Mines, a man who understands both pure science and applied science.

Mr. Hoover begins his address by showing the remarkable development of research both in pure science and applied. "We have an increase in some ten years from one hundred to over five hundred laboratories engaged upon search for application of known scientific facts and laws." All of these, he goes on to say, are dependent, however, upon the research in pure science for their material.

"The day is gone by," says Mr. Hoover, "when we can depend very much upon consequential recovery or invention being made by the genius in the garret. A host of men, great equipment, long patient scientific experiment to build up the structure of knowledge, not stone by stone, but grain by grain, is to-day the fundamental source of invention and discovery.

"Compared with other expenditures of far less importance to human welfare, the amount of money annually devoted in the United States to the aid of investigators and investigation in pure science is absurdly small. It is less than one-tenth of what we spend on cosmetics."

That, I may say, is Mr. Hoover's remark. I disclaim it. I disclaim it because I do not want to offend any of the perfumers or manufacturers of cosmetics that may be in this audience.

At a dinner the night before last of the Association for Highway Research, it was explained that the amount spent per capita for research of all kinds in this country is only a trifle more than the amount annually spent for pickles. (Laughter.)

Mr. Hoover estimates that the whole of the income available for sources of research in pure science certainly does not exceed $10,000,000 a year, whereas in the professional schools of our universities, in technical and agricultural colleges, and experiment stations, in industrial laboratories and in our Government bureaus we probably expend to-day $200,000,000 a year upon applied science research.

That is not too much. It is not too much in proportion; but there is obviously a need in almost every industry for more research in pure science, on which the industrial laboratories and the industrialists can base their own particular investigations and expand their business.

Mr. Hoover say: "Radio communication would have remained not merely impossible but wholly inconceivable except for the fundamental experiments of Faraday, the mathematical formulation of the wave theory by Maxwell, and the experimental realization of Maxwell's predictions by Hertz; successive advances in knowledge made without thought of immediate application or financial return."

Mr. Hoover says further: "No newspaper headlines noticed Becquerel's discovery of radio activity from which long after sprang the whole train of discoveries leading to radium and its vast human service. No one reads in the popular journals about the discovery of the theory of the hydrogen ion."

I was thinking of that remark of Mr. Hoover's to-day

while I listened to your discussion of the pH concentration, which bothers a great many of us who got our chemistry in the day before pH was discovered. (Laughter.) Mr. Hoover says: "We do hear sometimes of the effect in economy and production that its understanding is having upon scores of industrial processes, but how many know the name of the scientist who has added billions in money value to the world by the discovery of methods of determination of hydrogen concentration? I am not sure even that he had a stenographer to save his time in his race in search of other laws."

Then follows a paragraph that I had intended to cut out but which I will add on account of Mr. Claflin's interest in the subject of the Einstein theory of relativity, although it is not what I should have chosen myself for an after-dinner speech. But Mr. Hoover says: "The rise of the Einstein theory, which has revolutionized physical science and fundamentally affected modern thought, was rendered possible by the most abstruse developments of mathematics over long terms of years, and who may say that some day it may not become the raw material of our industrial laboratories with a fine outpouring of benefits in added human comfort and convenience?"

So you see that those of you who have mastered the pH theory may have the satisfaction of looking forward to other worlds to conquer; namely, the application of Einstein's theory of four-dimensional time space continuum to the industries of dyeing, and textile manufacturing. (Laughter.)

Mr. Hoover says: "If we were to survey the nation we should find that the technically trained men engaged in pure science research fall into two main groups: on one hand, those supported in the great pure science research institutions; and, on the other, those in our universities, or engaged in individual investigation. The number supported by our pure science research institutions, such as the Carnegie, Rockefeller, Smithsonian and others, does not exceed five hundred technically trained men. Those engaged in pure science research in our universities or upon their own resources probably do not exceed five thousand."

An interesting contrast to this is the fact that the scientifically trained personnel in our applied science investigation to-day probably exceeds thirty thousand.

Mr. Hoover concludes: "There is no price that the world could not afford to pay to these men who have the originality of mind to carry scientific thought forward with great strides—and they wish no price. No one can estimate the value to the world of an investigator like Faraday. Our whole banking community does not do the public service in a year that Faraday's discoveries do for us daily. As national assets, men of his type, even when much less gifted than Faraday in the past and Millikan to-day, are beyond valuation, and no effort should be spared to facilitate their work.

"It is true that money cannot buy genius, but many a genius in science has defaulted because he has had to eat."

We find a certain justification of Mr. Hoover's remark about the backwardness of American research as compared with many of the European nations in your own industry. Although all of the four present processes of making synthetic silk were first developed in Europe, the United States now leads the world in its production and consumption. The fact of it is, gentlemen, that in the field of science we Americans do not distinguish ourselves on the kick-off but we beat the world in keeping the ball going when once it is put in play. The world's output of these artificial cellulose products for the present year is estimated at about 185,000,000 pounds, and American manufacturers made nearly a third of the total. We may reasonably expect that next year the United States will turn out 74,000,000 pounds, which will mean a 600 per cent increase in the last five years.

Science consists in learning from nature how to surpass nature, how to produce some product if not better in a vague, general sense, better for some particular reason for certain purposes of man. The chemist in particular, like every true student, is never content till he can do something that his teacher can't. In the field of fabrics he has made dyes more brilliant than any to be found in the three kingdoms of nature, animal, vegetable and mineral, and now he is inventing new textiles to tint them with. The chemist has beaten the indigo plant on its own ground and has carried off the blue ribbon. (Laughter.) The chemist long ago challenged a snail to a race, the Mediterranean mollusk that produced the royal purple of the ancients, and beat him, for now the chemist is making a better dye out of a waste coal product and making it so cheap that anybody can afford it.

Now the chemist is engaged in another competition. His rival this time is a worm. He has challenged the champion spinner of the world, one who has for over four thousand years held the prize for the finest and most flossy fiber, the silkworm. The worm chews up mulberry leaves and spins out through his mouth a silk thread 500 yards long. The chemist grinds up logs of wood and spins out by means of his mechanical spinnerets a silky thread as long as he likes, for the machines run day and night and all the week long throughout the year. And the thread that the chemist makes is more uniform in size and substance; for the worm, although he was practising the spinning art thousands of years before man appeared upon the earth, has not yet learned how to produce a perfectly smooth and even filament. But these artificial fibers you can make in any length you like; you can make them in any size you like; you can

make them in any cross-section you like, and you can make them of any surface that you like. It is a marvelous thing.

Not long ago I visited one of the great rayon factories. I saw them floating logs in at one end of the factory and shipping out skeins of silky yarn from the other end, using up wood pulp which is worth about five cents a pound and selling the product for I don't know how many dollars a pound, for use in the form of neckties, shirts, sweaters and stockings—a chain of quiet and efficient processes all the way from the log to the leg. (Laughter.)

The difficulty that the chemist has is to receive credit for his creations. He is obliged for the most part to introduce them in disguise, even though he may not like to, because people are unwilling to recognize a new compound or product and receive it upon its face value.

The dictionary is a heavy and clumsy volume, and cannot keep up with the swift advance of science. That is one reason why we have so many imitations and so many "near things," instead of producing compounds to be sold upon their own merits. A synthetic product deserves a synthetic name. It is better to do what has been done in the case of synthetic resins. One of them is called Bakelite, the invention of Dr. Baekeland, and he explains that it gets its name because it is a stone substance and because it is baked in order to produce it in the form of a stone. I don't know whether the same method of interpretation applies to the case of Redmanol or not; but, at any rate, there is an advantage in introducing these substances under a new name, since they are new products.

There is no common name, so far as I have been able to find, for this general group of artificial synthetic fibers. They are often called artificial silk, or, what is worse, imitation silk, although they are not the same as silk and should never pretend to be. I understand that last year there was an effort made to introduce the general term "rayon" for all of these products, but in talking with the Celanese people, the Lustron people, and several others, I find that they repudiate the term "rayon," so the term seems to be something like these universal languages that nobody will speak. (Laughter.)

But the difficulty is to get the people to catch up with progress in the language that they use. For instance, there was a transparent gluey substance made out of fish bladders many years ago that was given the absurd name of isinglass, as though it were a kind of glass. By and by, they wanted a substance like that to put into the windows of the hard coal burners of that day. Isinglass wasn't very good for that purpose. You know how fish glue smells when it is subjected to high temperature. (Laughter.) So they got a mineral substance by the name of mica. However, people still went on talking about the isinglass doors of the stove. When the automobile was invented, there was need for some kind of little windows in there, and they made those out of mica; but for the most part they went by the name of isinglass, as though they were made out of fish glue. Nowadays those windows are made out of celluloid, but they are still called mica windows, if they don't go by the name of isinglass.

I am not going to devote any time to eulogizing the good qualities of synthetic silks. Those interested in the industry are quite competent to do that. Nor am I going to devote any time to a discussion of the weakness of these fibers, especially when wet. But I do want to call attention to one new possibility that has hardly received a sufficient amount of attention, and that is that synthetic fibers may be more transparent to the health-giving, healing ultra-violet rays than the ordinary fabrics.

Dr. Leonard Hill, who is a director of the National Institute of Medical Research, London, and one of the leading British authorities on heliotherapy, says that in order to get the full effect of the life-giving rays of the sun a woman should leave her neck and arms bare, and should wear a short skirt, and stockings of synthetic silk. It seems to me I have seen a costume like that not very many months ago, worn by somebody or other who never heard of Dr. Leonard Hill, and who couldn't tell ultra-violet rays from infra-red. That is the nice thing about science: After a custom has been established in spite of popular opposition and natural conservatism, the scientists come along and prove the rationality of it. (Laughter.)

As it is the business of philosophy to provide reasons for what we want to do, so it is the business of science to provide reasons for what we are already doing. (Laughter.)

Crops were rotated to maintain fertility and baseballs were rotated to prevent the batter hitting them, long before scientists explained why it worked.

So, too, the summer girl has long been laughed at by the world at large, caricatured by the cartoonists and scolded by the moralists because she followed all too literally the advice expressed in the old song:

> "Mother, may I go out to swim?"
> "Oh, yes, my darling daughter.
> Hang your clothes on a hickory limb,
> But don't go near the water."

The portion of the sunshine that has a beneficial effect upon the physiological functions consists of those dark rays which have a wave length of less than one hundred thousandths of an inch. They increase the percentage of lime and phosphorus in the body fluids, and increase resistance to disease. Tanning is an essential part of the process.

The bathing beauty—I use the conventional term, al-

though she is rarely bathing and very rarely beautiful—was acting in conformity with all the requirements, so far as local law allowed (laughter), when she kept out of the water and spread herself upon the sands in the sunshine. Unjustly accused of desiring to make herself conspicuous, she was really seeking the invisible component of the sunlight, and it was not her fault that this invisible component was inseparably associated with rays that rendered her visible to the passer-by and even the bystander. (Laughter.)

Having proved the therapeutic value of ultra-violet rays on the seashore, the summer girl has carried the bathing suit inland and now appears upon the street in all seasons in a costume that meets the requirements of the heliotherapist. (Laughter.) Although she may be barred from European cathedrals, the American maiden shelters herself under the Second Amendment to the Constitution, which stipulates that the right of the people to "bare" arms shall not be infringed upon. (Laughter.) The new style of sleeves in fringes will, if they spread downward, interfere with the exercise of the right as well as the left (laughter), but so far the threatened eclipse is being kept at arm's length.

This raises a question which demands masculine consideration. Will not these sun-kissed flappers when they grow up, if they ever do, be too big to beat and too smart for the unenlightened wits of men? For you notice that we men have not adopted those textile reforms which Professor Hill points out.

But there are a great many questions involved in such statements as this. I don't know, for instance, whether Professor Hill's statement applies to all of these fabrics, to the regenerated cellulosis, as it does to the acetate, which he particularly specifies. I cannot find any tests that have been made anywhere, and I have bothered my friends in the industry, as well as my friends in the Bureau of Standards, and in other places, to see if I could find out something about the relative transparency of different substances and different weaves to the ultra-violet rays and other parts of the solar spectrum. There is evidently need for research on the penetration of fabrics, various substances and weaves, both to light and to moisture.

For instance, speaking as a consumer, I recently read a rayon advertisement which told me that I ought to buy rayon underwear because it absorbs the perspiration and so protects me from catching cold. Then I read a Celanese advertisement which told me that I ought to buy Celanese underwear because it does not absorb the perspiration, doesn't get clammy, and doesn't make me catch cold. (Laughter.) I want to know which of these two is the most satisfactory. And there are a number of other questions I have been unable to find the answers to by searching the literature or getting my friends to search the literature for me.

For instance, I would like to know something more about the proper costume for a tropical climate, which unfortunately prevails over many of our States in the United States at certain seasons of the year. We do not know what fiber or what weave or what color is the best for such warm weather. What we find in the literature is confusing and conflicting, and doesn't inspire much confidence. One authority claims that the African negro was wisely endowed with a black skin, but some give the credit to the Creator and some give it to the chromosomes. But if black is an advantage to a person living in a sunny region, why is it that white is the preferred color for the clothing of that region?

Your Research Committee is very wisely engaged in a partial study of the fundamental problems of your profession, but every answer that you get reveals a new question. Research is like the entomologist who goes out into the woods or the fields. Every time he lifts up a stone he sees a dozen strange things scuttling away into the darkness of ignorance surrounding them.

The very interesting investigation reported this morning by W. D. Appel, on the causes of fading, made at the Bureau of Standards, is, as I see it, not only bringing out important facts, but it is showing the need of much more thorough study. Photochemical effects of the wave lengths of sunlight are widely different, as we know, from photography. Sunlight varies widely from place to place. Sunlight varies widely from minute to minute, and the statements of the authorities differ more widely than does the sunlight itself.

You might, for instance, have a dye which would fade in California and be fast in Florida, or, as one speaker put it this morning, fade darker. (Laughter.) The reflected and refracted rays coming from the blue sky or the white clouds or the water or snow are different in composition and chemical action as well as in intensity from the sunlight which is their original source. For one thing, I throw this out as one of those rash suggestions which a trained scientific man in the profession would hardly venture to suggest: The light so reflected or refracted is polarized, and all your cellulose and carbohydrates and amino acids, all the natural fibers, are, I believe, optically active.

Has anybody tried this experiment: Exposing fabrics to moonshine and sunshine of the same intensity, in order to compare their fading effects? (Laughter.)

That is a crazy experiment, but Bacon, the founder of inductive science, advised that people try crazy experiments once in a while—and I simply suggest that as one of the possibilities.

This is a fascinating field, the effects of light. For

instance, we know that an injection of a certain known chemical in the veins will make a person so sensitive to light that he will die if he goes into the sunlight, or even exposes himself to the reflected and refracted rays from the blue sky or white clouds, while he is perfectly well as long as he remains in a comparatively dark room.

We know that the sunshine is capable of developing, activating or producing certain vitamins, such as the antirachatic vitamin that is necessary for the formation of bone, for the deposition of calcium and phosphorus in the growing bone.

It has been found that it makes a difference what sort of rays (whether they are artificial rays or sunshine) act upon the hens, for if the ultra-violet rays are present they ought to produce large eggs with more calcium and more phosphorus, and with thicker shells. It is also known that the composition of the milk in its vitamin content depends upon sunshine.

What will happen when the advertiser gets hold of such information as this it is appalling to contemplate. We shall probably see upon pages of our most popular magazines and on billboards along our main traveled roads such advertisements as this: "Eggs from ultra-violet hens," or, "Milk from sunkist cows." (Laughter.)

Research has added a fourth group to the fibers at the command of the textile manufacturers, and the synthetic product is already a rival to the natural silk, cotton and wool, although it is not in any way displacing them.

But this is only a beginning. This is only a glimpse into the possibilities of the synthetic product. I have great confidence in the possibilities of synthetic products, in spite of the fact that Mr. Moffat informs me that I shall never live to see a synthetic shoe.

There is an Italian company under a German patent turning out a sort of synthetic wool which is made in very much the same way as rayon is made, but it is cut up in shorter pieces, and then in some way treated with an acid which gives it a curly, crinkly aspect such as the woolen fiber has. This is known as Sniafil, and is manufactured by a viscose company which employs 25,000 people, located in Milan, with some $5,000,000 capital, and they expect to produce 100,000 pounds a week of this so-called synthetic wool.

This information I have acquired so recently that I have not yet transferred it from my program to my notes.

In England there is a product which is known as Woolulose, which is an awful name. It is made direct from some kind of vegetable fiber by a new process which is different from that of any of the artificial silk methods.

In Switzerland, the Philana Company has given a new camouflage to cotton, converting it into a sort of woolly fiber, said to be warm and stout like wool. This "philanized" fiber is made by dipping cotton into strong nitric acid for a brief period. This, you see, is the reverse of the mercerizing cotton process, and instead of using alkali an acid is used which make it contracted, rough and crinkly instead of being soft and silky like the mercerized product.

All of these things you are more familiar with than I. I get them only at second hand, but I bring them here simply to call your attention to the way in which European nations are developing new processes; and in spite of the immense amounts of money invested in this country in such manufactures, and in spite of the energy with which our business is carried on, we are not always able to get in on the ground floor of the new process like some of these are.

Research is a peculiar thing. You never know where it is going to come out. It pays. It pays, in the long run. It pays, on the whole, but you never know when it is going to pay, and you don't know exactly the kind of coin it is going to pay the dividends in. It is somewhat like the boy who started out with a gun. Somebody asked him, "What are you going to do?" He said he was going hunting. They asked him what he was going hunting for. He said, "How can I tell until I see it?" (Laughter.)

I think the same thing applies to the research man if he is frank enough to confess it, because he very often does not find what he starts out to find, but often finds something very much better.

The first of the aniline dyes was discovered by a boy who started out to find something else; that is, by William Henry Perkin, who was trying to make an artificial quinine, something that has not yet been accomplished. Instead of that he got one of those reactions which is the most disgusting thing in a chemical laboratory, and the most disappointing. If, when you come to wash it up it turns out to have nothing but a kind of black, tarry substance, then you have to put down in your report that the product unfortunately polymerized into a resin, or something of that sort (laughter), and try and clean out the beaker.

Well, when William Henry tried to clean out the beaker he found he couldn't do it. The more water he put in the more purple it became, and that was the origin of the long series of aniline dyes which has transformed the world, not only commercially but socially, financially and esthetically. The esthetic and emotional effect of these factors in our civilization are doubtless more important than the material, but they are more apt to be overlooked because they cannot be estimated in pounds or in dollars.

For instance, what is the psychological effect of the millions of dollars that have been spent in this country, hundreds of millions of dollars, for perfumes, compared with the very little that was spent not many years ago? What is the psychological effect of the varied tints that the chemists have introduced?

In that connection, I consulted the sex which takes most delight in color, or at least which makes the most use of it. I quote from a private letter from a woman professor of chemistry in one of our leading colleges for women:

"Our colors are very much more beautiful than those we had formerly. I remember, the first aniline dyes were introduced when I was a little girl. Crushed strawberry and raspberry were fashionable. The colors improved greatly, but they have never since then been so beautiful as they are getting to be now. There is a whole range of colors developed by our chemists which are entirely new; all the shades of henna, of jade, Russian green, the rose colors, to mention only a few. They are much more suited to our climate, to our taste and to our fabrics than the German dyes, which so often looked dowdy. If a color is pleasing our chemists can introduce more varieties in it, just as has happened with henna. At first, there was only one shade; now there are many more, delicate ones suited to summer skies and deeper ones for winter. The psychological effect of color is beginning to be understood very much better now than it was formerly. The colors which our chemists have introduced are so much more refining and stimulating than the old ones. A lovely color gives an esthetic pleasure, oftentimes surpassing that of music, and sometimes makes the possessor of it aspire to something higher and finer. It brings freedom with it."

That is the expression of a woman chemist, evidently with some artistic feeling in her soul.

Upon these various fabrics, the new and the old, and the various transformations, you colorists have a chance to play your themes with your one-octave instrument of color. The musician, you know, has eight or more octaves to work with. You have only one, consisting of all the colors of the rainbow, and it is rather difficult to get other colors outside of the rainbow, although sometimes you are able to accomplish it. (Laughter.) But with the combinations of these eight colors in their various tones, you are able to produce all of these very remarkable effects.

In the textile industry you occupy a strategic position, from a cultural as well as a commercial viewpoint.

Some years ago I visited certain of the new British universities for the purpose of comparing them with the American. I was particularly interested in Manchester University. Manchester, you know, is a city which is closely identified with the textile and the dyeing industry. They have taken there an old classical English college, Owen College, and converted it into a university; they have erected a Municipal School of Technology and combined their technical work and their cultural work, the old education and the new education, the classical education and the practical education, in a most remarkable way. I don't know exactly how they have done it, but they certainly accomplished it in some way. The Municipal School of Technology is an architectural ornament to the city, as is the Massachusetts Institute of Technology. Of course, it is very much smaller, but still it is beautiful from an artistic point of view.

The combination of the old, classical Owen College and the new, practical, industrial courses must have been rather difficult. I don't know how they got together the hard-headed business man and the highbrow university man, who so rarely talk each other's language. I imagine that the business men who were putting up the money laid down their terms definitely and said something like this: "Now, stick to business. Don't run in any of your highbrow studies, such as philosophy and esthetics, ancient history, and so forth." And probably the university men said, "Right-o!," and then they began.

They began strictly on a business basis, teaching the trade, teaching the craft, teaching the shop boys and the shop girls what they particularly needed; and they added on other courses as they became necessary, to give the background, or the extension, or the investigation side of the practical courses closely allied with the industries that were providing scholarships in the institution.

They began with textiles, probably; but textiles, of course, involves a knowledge of botany, and botany involves a knowledge, unfortunately, of entomology, and also a knowledge of climatology. Also, the clothing habits of all nations have to be considered in connection with textiles. Then, of course, the students have to go into the psychology of fashion. They have to concern themselves with the ethics of dress in different countries and at different periods in the world's history. And dyeing has to be studied, which is not a simple thing when you get outside the rule-of-thumb, traditional methods. You are apt to get into chemistry, you are apt to get into physics, you are apt to get into pH's, and you are apt to get into designs of various kinds, and designs lead you into fundamental principles of esthetics. You can't study esthetics without studying the ornamentation and costumes of the Greeks, the Romans, the Assyrians and the Egyptians.

For example, if a manufacturer of costumes orders his designer to bring in by Monday a Tutankamen pattern he has to study up his Egyptology very promptly.

They also have to study what the classical students do not study; they have to study the Chinese and Japanese civilization, as well as the several traditional classical civilizations of ancient Greece and Rome, and I venture to say that some of these strictly technical students who haven't put in anything except what is required to get a knowledge of their business know more about the actual life of the people of classical times than do those who have confined themselves to the study of the required Latin and Greek texts.

That is the characteristic of science. Everything is somehow connected with everything else in the world. Science is a matter of finding out the relations between things, and all things are related.

There was once a farmer who tried to sell his farm. He advertised it as of particular value because of its unique situation. "Starting from this place," he said, "you can go to any part of the entire world," which was literally true, and a very important fact and a very new fact, because it never could be accomplished in any previous age.

The same thing is true of every science, every branch of science, of every industry and of every particular branch of every industry. If you enlarge it legitimately, not losing track of your starting point, you may embrace the entire world.

Once when Abraham Lincoln was in the White House there arose a question as to what was the proper height for a man. They couldn't settle it. They agreed to leave it to the President when he came into the room. So when President Lincoln came in they said, "Mr. Lincoln, how long do you think a man's legs ought to be?" Mr. Lincoln replied that in his opinion a man's legs ought to be long enough to reach from his body to the ground. (Laughter.)

I think the same thing ought to be said of any science. No matter how far the science may arise into the ether, it must somehow keep its connection with the ground. There must be the two sides of the aspiring part of the science aiming off into the unknown regions of space, and at the same time it must be grounded. Those of you who are radio fans know that your radio receiving apparatus works best when it is well grounded. I think the same thing is true of any science. (Applause.)

Toastmaster Claflin—Gentlemen, this concludes our formal ceremonies. I only wish further to extend to you an invitation to all be present next year at Greenville, S. C. (Applause.)

WINTER MEETING OF THE SOUTHERN SECTION

The Southern Section of the American Association of Textile Chemists and Colorists will hold its winter meeting at the Alamance Hotel, Burlington, N. C., on Saturday evening, January 23, 1926.

Dr. E. C. Brooks, President of the North Carolina State College, will deliver the principal address, which will relate especially to "The Importance of the Technical Man to the Textile Industry." As the head of one of the principal institutions in the South engaged in training young men for the textile industry, we may expect a message of unusual importance to the men charged with the dyeing and finishing of our textile products, and to the industry as a whole.

Dr. Brooks will be followed by a general discussion of a number of live subjects, which will be led by M. T. Johnson, of the Judson Mills, Greenville; J. T. Chase, of the National Aniline & Chemical Company, Inc., Charlotte; W. D. Shields, of the Durham Hosiery Mills, Durham; C. R. Ephland, of the E. M. Holt Plaid Mills, Burlington, and Malcomb Mackenzie, of the Sandoz Chemical Works, Inc., Charlotte.

A. R. Thompson, Jr., of the Rohm & Haas Company, Inc., Charlotte, will tell of his impressions of the Annual Meeting of the Association, recently held in Boston, which he attended.

DECEMBER MEETING OF THE RHODE ISLAND SECTION

The regular December meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held in the rooms of the Providence Engineering Society on Friday evening, December 18, 1925.

The meeting was called to order by Chairman Walter S. Williams at 8.15.

Mr. Williams was the speaker of the evening, his subject being "Some Phases of the Manufacture and Use of Hydrogen Peroxide in the Textile Industry." His speech was illustrated with blackboard diagrams. At the conclusion of the address a period of discussion took place.

A rising vote of thanks was rendered to Mr. Williams. The meeting adjourned at 9.30. Thirty-three members were present.

ALBRO N. DANA, *Secretary.*

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Active Membership

Doubman, John M., chemist and dyer, John B. Stetson Company, Germantown, Philadelphia, Pa. Sponsors: W. N. Watson and J. J. Sokolinski.

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AMERICAN
DYESTUFF REPORTER

SAMPLE SWATCH QUARTERLY

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

CLAYTON HOAGLAND
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RETROSPECTIONS OF A SPECTATOR

THERE is something very disheartening in the picture of American industry's extensive dependence upon foreign sources of supply; something close to irony in the thought that we who have attained industrial supremacy of the world have been so uneconomic in our methods as to allow other nations to control the supplies of many basic raw materials upon which our supremacy depends.

This is the condition deplored by Secretary Hoover in his disclosures a few days ago before the Committee on Interstate and Foreign Commerce. He declared that foreign government monopoly of nine raw materials—among them rubber, nitrates and potash—are forcing our manufacturers to pay exorbitant prices that have no relation to the cost of production. Rubber, cited as a typical example, has jumped in the past four years from sixteen cents to over a dollar a pound. And this price-fixing, he said, has all come about through the intrusion of alien governments into trading operations on a vast scale. We must go to England for our rubber, to Chile for our nitrates, to France and Germany for our potash, and in all these sources the distribution and prices are officially controlled.

If the industries of the United States are to maintain their place on the trade map of the world, Secretary Hoover warned, they must take immediate steps to break free of this dependence upon foreign sources of supply. His words have a significance beyond their application to the particular industries involved. To quote from part of his address:

> The best and most permanent cure for this threatened evil . . . is for us in our strength to demonstrate that we can secure freedom in our raw materials, that thereby these combinations cannot succeed economically; that we need not do this by reprisals or by threats, but by setting up some such measures within our own borders and through our own agencies and operations abroad as will bring relief.
>
> If nothing more comes of this investigation than an illumination of the dangers which lie in these controls and the awakening of our people to the necessity of voluntary action in conservation and in development of the procurement of independent supplies, it will have accomplished much, for it will have served notice upon these controls that our people will resist. Building up resistance is not a pleasant job because it is necessarily subject to misrepresentation, but to say that our people must tamely submit is intolerable.

In contemplating such a deplorable condition some industries in this country are in a position to sit on the fence while the fight is on, and to "philosophize," so to speak, upon their good fortune in having previously secured their independence from foreign control. Such a spectator is the American textile industry; such a spectator is the American dyestuff industry. Together they can now rejoice; together they can indulge in a tete-a-tete of mutual admiration. In their somewhat unsympathetic elation they can paint in lurid colors all the details of the calamity that would have befallen them had the menace of foreign domination met with no resistance in that most dark and uncertain period of their existence, the years during the war and shortly after.

Wise indeed were they who built up their resistance while their opponents were recovering from the war's economic depression. Their fight was long and lusty and many were the abuses cast upon their heads. One after another, like milestones, battles mark our dye industry's progression from an obscure but undaunted infancy to its present independence. Not in vain did it fight for protective legislation, nor in vain was its defense against its own Government's attempt to deprive it of the very fountain-head of its strength. From its birth it seemed doomed, with alien cartels pitted against it in a merciless commercial war that is only now being recognized in its true strength in other industries—now, when the adversary holds under his thumb the sustenance which those industries must have to exist.

With the spectacle in mind of our textile industry at the mercy of gouging alien combinations—as it certainly would be without an assured home supply of dyestuffs—how insignificant appear now all the petty grievances which were heaped at the door of our dye industry in its early days. Now, with ample supplies of colors for American mills always available, now, when our textile, paper and other dyestuff consuming industries can be passive spectators in the war which Secretary Hoover declares American industry must wage against alien monopoly, now, we say, when we look back upon the road, it seems as though our dyestuff industry was guided by a divince Providence that led it victorious through its valiant struggle for existence.

Yet does there seem to be that appreciation which such

a victory deserves? There are still mutters of discontent. While insinuations of an American dyestuff monopoly are confined for the most part to testimony against the Chemical Foundation, there is still prevalent that brand of petty dissatisfaction that busies itself with complaints of a lack of this color or an alleged inferiority of that—all so ridiculously unwarranted in the light of the unnamed advantages of having a home industry to supply essential raw materials at reasonable prices.

SHADE CARD INFORMATION REGARDING ACTION OF DYES TO METALS

IT is interesting to note that the shade cards issued periodically by the larger dyestuff manufacturers and dealers tend to give a constantly increasing amount of data relative to the dyeing properties of the respective colors which the cards cover

We note particularly that the National Aniline & Chemical Company on all of its more recent shade cards cites the action of the color when dyed in vats or machines composed of various metals; notably iron, copper and Monel Metal.

An examination of a number of these cards seems to indicate that nearly all colors are affected to some extent by iron; a considerably smaller number by copper and a very small percentage by Monel metal.

Hence, it would seem that the experience of the National Aniline & Chemical Company bears out the current opinion generally held throughout the trade that Monel Metal is, for a majority of purposes, the most satisfactory material that can be used in the construction of dye vats or machines.

It is also interesting to note that the National Aniline & Chemical Company has been sufficiently progressive to include data on the reaction of their colors to various metals and it would seem that other manufacturers might well follow their example.

ACETATE SILK—ITS DYES AND THEIR APPLICATION

(*Continued from page* 2)

Eosine Crimson 2B
Brilliant Milling Violet S4B
Citronine G
Monochrome Orange R Paste
Monochrome Brown G Paste
Monochrome Brown H Paste
Anthracene Blue 2BR
Anthracene Blue 2B
Brilliant Chrome Violet 4BR
Anthracene Yellow C
Brilliant Alizarine Blue G
Chrome Violet G
Alizarine Bordeaux Paste
Oxychrome Orange RW
Oxychrome Brown GR Extra
Oxychrome Brown BG
Alizarine Brilliant Blue B

Method No. 125: *Alkali Blue on Acetate Silk.*—Alkaline Blue H5B (Alkali Blue) may be applied to acetate silk in a neutral salt bath at 60 to 70 deg. Cent. (140 to 158 deg. Fahr.) for about an hour. The fiber should then be rinsed and the color developed at 40 to 60 deg. Cent. (104 to 140 deg. Fahr.) in a formic acid bath. In case acid dyes are used with this blue, they may be applied in the acid developing bath.

The Setacyl Direct Dyes

(Note—The author is indebted to C. W. Mahnken and D. P. Knowland, of the Geigy Company, for data upon the application and properties of the Setacyl dyes.)

The most recently announced dyes for acetate silk are the Setacyl Direct dyes. These products are in powder form and directly soluble in boiling water which, of course, renders their use somewhat easier than in the case of paste products. It has been stated that they are entirely separate and distinct from any dyestuffs now on the market, and entirely different from the Setacyl and Setacyl Brilliant dyes of the same company. As yet nothing definite appears to be known regarding their constitution, but it appears probable that they may be carboxylated aminoazo compounds, in which case they would be classed as acid dyes. They are applied to acetate silk in exactly the same manner as the direct dyes are applied to cotton, i. e., in a neutral salt dye bath.

A wide range of shades are available and as they are applied at low temperatures in a neutral bath, their application leaves the acetate silk entirely unaltered in every way. They have good fastness to light, washing and rubbing, and withstand cross-dyeing well, with only a slight staining of the cotton or viscose in some cases. They are recommended for use in the same dye bath with the Art Silk Colors CW, to produce multicolor or shot effects on acetate silk-cotton or rayon unions at a very low dyeing cost.

The Setacyl Direct dyes have given excellent results in printing by the ordinary methods, both on acetate silk and unions containing it. While these dyes do not discharge white, the ground is usually sufficiently clear to give excellent colored discharges. Table No. XXV gives some data upon the fastness of the various Setacyl Direct dyes, and at the same time serves as a list of the colors available. Their fastness to cross-dyeing permits their use in men's wear with colored acetate silk effects.

Table No. XXV

Fastness Properties of Setacyl Direct Colors

Dye	Fastness to Washing	Water	Rubbing
Setacyl Direct Blue G Powder....	3	2-3	5
Setacyl Direct Blue R Powder....	4–5	4	5
Setacyl Direct Yellow 2G Powder.	5	5	5
Setacyl Direct Yellow GR Powder.	5	5	5

Setacyl Direct Yellow R Powder..	3–4	2–3	4
Setacyl Direct Yellow 2R Powder.	5	5	5
Setacyl Direct Orange G Powder..	4	4	3–4
Setacyl Direct Orange 2R Powder.	3–4	3–4	4
Setacyl Direct Red B Powder.....	3–4	3	4
Setacyl Direct Red G Powder.....	3–4	3	4
Setacyl Direct Scarlet G Powder..	3–4	3–4	4
Setacyl Direct Scarlet 2G Powder.	5	5	4
Setacyl Direct Black B Powder...	3–4	2–3	5
Setacyl Direct Black R Powder...	3–4	2–3	5
Setacyl Direct Black G Powder...	3–4	2–3	5

Method No. 126: Setacyl Direct Dyes on Acetate Silk Skeins.—In applying these dyes to acetate silk use methods similar to those used in applying the direct dyes to cotton to leave silk white. For instance, light shades may be obtained without using salt in the dye bath, but heavier shades may require from 10 to 20 per cent of Glauber salt. The goods should be entered at 38 deg. Cent. (100 deg. Fahr.) the temperature raised to 82 deg. Cent. (180 deg. Fahr.) in about twenty minutes, and the dyeing continued for about the same length of time at this temperature. For blacks, it is recommended to start the dyeing at 60 deg. Cent. (140 deg. Fahr), slowly raise the temperature to 75 deg. Cent. (168 deg. Fahr.) and run for as long as two hours.

The temperature is a large factor in matching shades.

Method No. 127: Setacyl Direct Dyes on Acetate Silk-Real Silk Unions.—In dyeing acetate silk in combination with real silk for multicolor effects, the addition of 5 per cent of acetic acid, after twenty minutes at 82 deg. Cent. (180 deg. Fahr.) will feed the acid dyes onto the real silk from the same dye bath.

(Part I will appear in an early issue)

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

MIDLAND VAT BLUE 5B

(Schultz No. 883)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With hydrosulphite.

SHADE: Redder than S-893.

SHADE BY GASLIGHT: Goes greener.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Inferior to S-893.

FASTNESS TO:

Acid: Good.
Alkali: Inferior to S-893; goes greener.
Chlorine: Inferior to S-893.
Cross-Dyeing: Inferior to S-893.
Fulling: Inferior to S-893.
Ironing: Fast.
Light: Inferior to S-893.
Perspiration: Fast
Rubbing: Good.
Washing: See fulling.

DYED BY OTHER METHODS: The method of dyeing is as follows: 9 c.c. caustic 30 deg. Be., 6½ grams calcined soda, 2½ grams hydro, 3c.c. Turkey Red oil; add this solution with stirring to the dye bath at 150 Fahr. The reduction of the color follows.

DISCHARGING: Discharges with glucose and Rongalite.

COMPETING PRODUCTS: Made in the United States by the Dow Chemical Company, under the name of Midland Vat Blue 5B.

INDIGO EXTRACT

(Schultz No. 877)

COMPOSITION: Made by treating S-874 with fuming sulphuric and salting out.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Dull shade of blue.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Paste better than powder.

LEVEL: Excellent; can be fed on at the boil.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Fast.
Carbonizing: Stands carbonizing.
Fulling: Not suitable; bleeds badly and stains whites.
Ironing: Fair.
Light: Poor; used for ladies' dress goods.
Steaming: Stands a moderate steaming.
Sulphur: Fast.

OTHER PROPERTIES: Strength measured by titration with permanganate. Type for Class V to fulling American Classification.

DYED BY OTHER METHODS: After-chromed in a fresh bath of 3 per cent chrome and 10 per cent acetic, a dull green.

ON OTHER MATERIALS: Gloria; dyed acid, the silk is left white.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, Inc., under name of Acid Blue GR; American Aniline Products, Inc., under name of Amanil Brilliant Blue; Tower Manufacturing Company, under name of Indigo Carmine and Indigo Extract; National Aniline & Chemical Company, under name of Indigotine; E. I. du Pont de Nemours & Co., under name of Indigotine.

PONTAMINE DIAZO ORANGE

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Soda ash, Glauber salt and Orange Developer C.

SHADE: Reddish yellow.

FASTNESS TO:

Acid: Equals Primuline and methyl-phenyl pyrazolone.
Alkali: Turns reddish.
Boiling: Moderate.
Chlorine: Inferior to Primuline and methyl-phenyl pyrazolone.
Cross-Dyeing: Good but inferior to Primuline and methyl-phenyl pyrazolone.
Ironing: Equals Primuline and methyl-phenyl pyrazolone.
Light: Equals Chloramine Orange G (S-11).
Washing: Very good.

DYED BY OTHER METHODS: Developed with developer A, a reddish orange of good fastness to washing and cross-dyeing.

PRINTING: Discharges white with Rongalite and zinc. Primuline does not discharge white.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co.

DIRECT FAST ORANGE R AND 2RL

(Pre-war name, Benzo Fast Orange R and 2RL)

USUAL METHOD OF DYEING: Glauber salt and soda.

SHADE: Brighter and redder than S-392.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Fair.

LEVEL: Excellent; better than Diamine Fast Orange ER and EG.

EXHAUSTS: Fairly well.

FASTNESS TO:

Acid: Fast to acetic.
Alkali: Fast.
Chlorine: For a weak short bleaching, suitable.
Ironing: Dry, changes somewhat.
Light: Very good; better than Toluylene Orange (S-392).
Rubbing: Very good.
Washing: Bleeds into white cotton.

SENSITIVE TO METALS, LIME: Sensitive to copper and iron.

OTHER PROPERTIES: Fast to lye; therefore adapted for crepes and pad dyeing.

ON UNIONS: Well adapted for dyeing artificial silk, silk and cotton-silk unions. The dyeings on silk are not fast to water.

ON OTHER MATERIALS: In dyeing half-silk the silk remains almost white. Not adapted for dyeing cotton-wool unions as the wool is deeper than the cotton.

DISCHARGING: Discharges white with Rongalite.

COMPETING PRODUCTS: Made in the United States by Cincinnati Chemical Works.

DIAZINE BLACK DR

(Pre-war prototype, Zambesi Black D)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Glauber salt or common salt and soda. Dyed and developed with developer A or H.

SHADE: With H, a reddish black; with A, a bright bluish black.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Good to acetic; bluer with sulphuric.
Alkali: Good to ammonia and soda.
Boiling: Poor.
Chlorine: Poor.
Cross-Dyeing: Fast
Ironing: Fast.
Perspiration: Fast.
Rubbing: Fast.
Washing: Fast.

ON OTHER MATERIALS: Also adapted for half-silk. Dyes the silk a reddish black, and it is therefore necessary to top with basic colors.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company.

PONTAMINE COPPER BLUE RRX

(Pre-war prototype, Oxamine Copper Blue RR)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Salt and soda at the boil; after-treated with bluestone.

SHADE: Dull reddish blue.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Very good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Fast.
Alkali: Good; beats S-410.
Chlorine: Slight.
Cross-Dyeing: Slight.
Ironing: Temporarily redder.
Perspiration: Fast.
Rubbing: Fast.
Sulphur: Fast.
Washing: Excels S-410.

SENSITIVE TO METALS, LIME: Copper makes the shade lighter and redder.

OTHER PROPERTIES: Suitable for topping indigo.

DYED BY OTHER METHODS: After-coppered, color is faster to light and washing. The shade is the same. Topped with nickel sulphate, very little change in shade; no faster to washing, not as fast to light as with after-coppering.

ON UNIONS: Cotton-wool unions: Cotton a bright navy blue. Wool a thin violet.

ON OTHER MATERIALS: Cotton-silk unions: Silk stained reddish.

PRINTING: No interest.

COMPETING PRODUCTS: Made in the United States by E. I. Du Pont de Nemours & Co.

Technical Notes from Foreign Sources

Bleaching Different Varieties of Flax

The dark colored substances which are obtained by retting flax in water are readily attacked by chlorine. When flax fibers have been well retted the coloring matter is destroyed in the first treatment with chlorine. Dutch blue flax requires relatively large quantities of chlorine for the destruction of the dark-colored impurities, and the residual yellow coloring matter is more difficult to remove by chlorine alone than by vigorous treatment with alkalies. It is attacked by chlorine only after treatment with alkalies. The individual properties of different varieties of flax are not destroyed by uniform treatment in the same bleaching bath, and it is not advisable to spin different varieties together into yarn. (Faserforsch, 1925, 4, pages 200 to 212.)

Sulphur Content in Wool

According to Chemical Age of London, in a paper read before the Nottingham Section of the Society of Chemical Industry there was discussed the nature of wool protein. It was said that Rackow's results in which sulphur dioxide was obtained by treating the wool with phosphoric acid could not be confirmed. Neither could organic sulphides nor mercaptans be obtained by the action of alkalies on wool, as was stated by Chevreul. When wool was heated with the addition of hydrochloric acid to a temperature of 70 deg. Cent., a portion dissolved, and when the solution was neutralized to a pH value of 4 to 5, a protein containing 3.62 per cent of sulphur was precipitated. This was called protein A. The filtrate was then saturated with magnesium sulphate when another protein containing 4.1 per cent of sulphur was thrown down.

The portion which was insoluble in hydrochloric acid was soluble in ammonia and was purified by reprecipitation with acid. The product was called protein B and was found to contain 1.49 per cent of sulphur.

When wool was treated with a normal solution of sodium hydroxide a constituent was dissolved which was protein B. When cold hydrochloric acid was used in the place of hot, protein B dissolved and protein A was insoluble. Water under a pressure of two atmospheres dissolved a constituent which contained the same percentage of sulphur as protein B and left an undissolved residue containing 2.55 per cent of sulphur, which might be protein A after it had undergone some decomposition. Protein A lost sulphur readily when treated with chlorine or hydrogen peroxide but protein B was unaffected under similar conditions.

It was suggested that the cortex consisted mainly of protein B and the epithelial scales consisted mainly of protein A. Results showed that the sulphur content of these proteins was constant, hence differences in the amounts of sulphur contained by the different samples of wool were due rather to the variations in the relative proportions of the constituent proteins than to differences in the compositions of the porteins themselves. From their experiments it was clear that the assumption that wool consisted of only one protein, namely, keratin, was unwarranted.

Stripping and Decolorizing with the Aid of Hydrosulphite

In many cases it becomes necessary for the dyer to strip the color off a dyed fabric, which in other words merely means to destroy it. Hydrosulphites are much employed at the present time for this purpose. There are various commercial preparations which consist mainly of this substance, and then again the dyer himself is more or less accustomed to preparing the hydrosulphite in his plant. This is a very easy matter and consists in making up a 20 deg. Be. solution of sodium bisulphite and then while constantly stirring in adding zinc dust in admixture with water. The solution is then allowed to settle and then the clear solution is drawn off and is ready to be used in the dyeing process. The reaction must be allowed to take place at a lowest possible temperature in order to avoid loss of hydrosulphite. The solution is

used by first heating it up to a temperature of 50 deg. ent. and then slowly raising its temperature to the boiling point. Then the solution and the dyed fabric that is contained in it are maintained at the boiling temperature for approximately half an hour until the color has completely disappeared from it.

There is one type of special hydrosulphite preparation found on the market which consists of the pure compound. This is known as burmol. It is used by dissolving from 100 to 150 grams in 100 liters of water. Then the goods are entered into this solution at a temperature of 50 deg. ent., it is brought up to the boiling point and then allowed to remain there for a period of twenty to thirty minutes. The goods are thereafter washed with water.

The method of using hydrosulphites in a neutral bath without the addition of acid has many advantages. In the first place the saving in acid is a material advantage, but in this connection it must be mentioned that neutral liquors are not so well suited for the treatment of the animal fibers as the acidified solutions. On the other hand the main advantage of the neutral solution lies in connection with its use on vegetable textile fibers and in the white washing process. In this case it is possible to add the neutral solution directly to the soap solutions, whereon it serves to cleanse strongly spotted and not perfectly cleanly washed fabrics. The process must, however, be carried out in wooden vessels, for when performed in metallic vessels there is a tendency for the formation of spots and the goods attain a gravish cast.

Hydrosulphites are also employed in the bleaching process, and in this connection they are better suited for the bleaching of the animal textile fibers. In comparison with the sulphur dioxide bleaching process, they possess the advantage of not having the unpleasant odor of the sulphur dioxide gas. Inasmuch the hydrosulphites are available in the dry form, it is possible to handle them more readily and use them with greater efficiency than the liquid or gaseous sulphur dioxide. It is usual to treat the fabrics first in a bath of potassium permanganate, 30 grams of permanganate to 10 liters of water, and then they are treated in a solution of hydrosulphite containing from one-half to one per cent of the salt, according to the intensity of the white color that it is desired to secure. Thereafter the fabric is washed, soured and washed once again.

The case of hydrosulphites and hydrosulphite compounds results in the complete removal of substantive coloring matters from wool, semi-wool, silk and half silken fabrics. In the case of the animal fibers the formaldehyde hydrosulphite compound is best indicated, as when this is employed in an acid solution the tendency to weaken the fiber is removed. Sodium hydrosulphite is employed for removing the colors from cotton, jute and artificial silk. The process is carried out in baths which contain caustic soda, carbonate of soda, soap and sodium hydrosulphite.

The question as to which of the two, sodium hydrosulphite or formaldehyde hydrosulphite, is the stronger, can generally be answered in the following manner, namely, that equally as good results can be obtained with both products, for in all cases where the sodium hydrosulphite is not indicated, the use of formaldehyde hydrosulphite will also give poor results.

In addition to the substantive coloring matters most of the acid coloring matters are removed by hydrosulphites. In many cases, however, although the color will be destroyed when the goods are boiled with the hydrosulphite solution, when they are allowed to hang in the air to dry, the color is redeveloped by the oxygen of the air or even by the action of washing. Then again the chrome, the sulphur and the vat colors are not attacked by the hydrosulphites. Of the basic coloring matters Rhodamine, Eosine. Phosphine and Methylene Blue 2B are very resistent to hydrosulphites and are not destroyed even after long boiling with this chemical.

For further details see Deutsche Faerber Zeitung, November 8, 1925, pages 1373-4.

AUGUST KLIPSTEIN

As we go to press, word reaches us of the sudden death of August Klipstein, president of A. Klipstein & Co., which occurred at his home, 378 West End Avenue, New York City, on Friday evening, January 8, 1926. No details are presently available, but will be published in our next issue.

DYEHOUSE OVERSEER

WANTED—Dyehouse overseer, thoroughly familiar with the handling and dyeing of piece goods, including glove silk, wide tubular and woven broad silk goods. Must be real, live man, capable of getting quality and production, able to handle and train labor and generally organize a dyehouse to run economically. State age, experience and salary required to Box 323, American Dyestuff Reporter.

PRINT WORKS CHEMIST

Experienced textile print works chemist and colorist, university graduate, desires position. Middle aged, married. References. Address Chemist, 66 Marlboro Street, Newton, Mass.

DYESTUFF PLANT CHEMIST

Wanted—Chemist for dyestuff manufacturing plant. Should be familiar with dyestuff standardization. Good opportunity. Reply giving experience and salary desired to Box 324, American Dyestuff Reporter.

HOSIERY DYER

Hosiery dyer and graduate textile chemist with extensive experience on all classes of hosiery. At present employed; desires change. Reply Box 325, American Dyestuff Reporter.

After 33 years

of Hosiery manufacture

ROLLINS HOSIERY MILLS Writes:—

"—everything that comes in contact with any dye solution is Monel Metal lined. We are thoroughly sold on your product and and do not use any other type of metal receptacle in our dye house."

View in dye house, Rollins Hosiery Mills, Des Moines, Iowa, showing battery of Monel Metal "Smith-Drum" hosiery dyeing machines made by SMITH, DRUM & CO. OF PHILADELPHIA.

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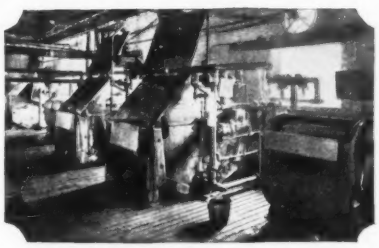

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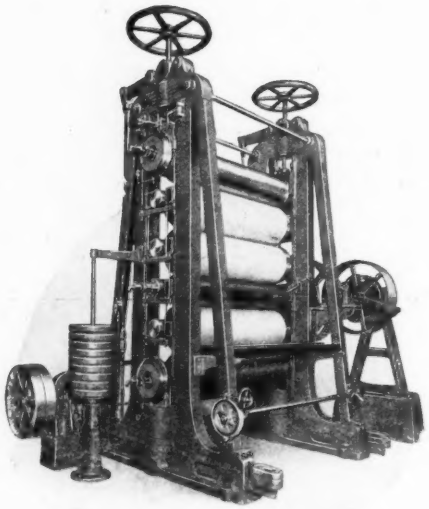

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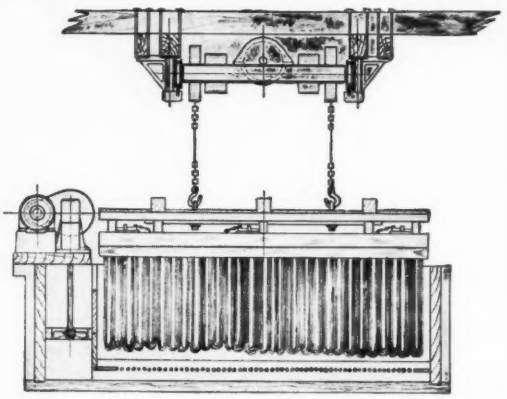

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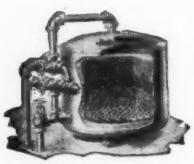

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Contents of This Issue

January 25, 1926

Acetate Silk—Its Dyes and Their Application—Part V 43
Charles E. Mullin

Foreign Dyes Imported Through New York and Other Ports During December... 45

Proceedings of the American Association of Textile Chemists and Colorists

November Meeting of New York Section.. 49

Vat Dyes on Cotton—*An Address* by M. E. Tice..... 49

Discussion of Vat Dyes on Cotton..... 51

Discharge of Vat Colors by Reduction—*A Paper* by Jean Kern..... 52

Vat Dyes for Wool—*An Address* by Charles A. Seibert 56

Discussion of Vat Dyes for Wool..... 58

Discussion of Vat Dyes on Silk..... 60

Sodium Silicate as a Corrosion Preventive—*A Paper* by R. P. Russell..... 61

Applicants for Membership..... 65

Resignations 65

Changes of Address..... 65

Editorials:
Mr. Frear Again..... 67

The Commercial League of Nations..... 67

August Klipstein 68
Recent Literature 69
Dyestuff Tables 70

The Reduction Products of Azo Dyes—Part VIII 72
Walter C. Holmes

Technical Notes from Foreign Sources.... 74

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Acetate Silk—Its Dyes and Their Application

Part V

SUPPLEMENTAL TO THE PRECEDING SERIES OF ARTICLES ON DYEING ACETATE SILK

The Dispersal Dyes—Celascour—The SRA Dyes—Fastness Properties on Celanese—The SRA Blacks

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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THE dispersal dyes are a very important and rapidly growing group of dyestuffs for acetate silk and were discussed in Parts XI, XII and XIII of "Dyeing Acetate Silk," pages 517 to 593 (Vol. XIV, AMERICAN DYESTUFF REPORTER). Of the dispersal class of dyes, the SRA dyes, which were developed particularly for use upon Celanese, are possibly the most widely known. The scouring and wetting-out of the Celanese fiber preparatory to dyeing was covered by Methods No. 1 and No. 2, of Part II, of "Dyeing Acetate Silk," pages 215 and 237. Recent information upon the dyeing of Celanese include data upon the use of Celascour, which is used both as a dyeing assistant in connection with the SRA dyes and as a scouring agent.

The unusual chemical composition of acetate silk, as compared with the other textile fibers, of course changes the scouring conditions very materially, as has been pointed out repeatedly in the preceding articles. At the present time there are a wide variety of scouring compounds offered upon the market, some of which are excellent for certain special purposes on various textile fibers. Most of these are combinations of soaps and solvents, and many contain free alkalies. Considering the nature of acetate silk, it is almost impossible to predict the possible action of these scouring agents upon this fiber, and they should be used with extreme caution until complete tests, including dyeing and finishing, have been made upon the scoured fiber.

CELASCOUR

Celascour was developed and placed upon the market by the manufacturers of Celanese, particularly for use upon Celanese and materials containing it. This compound is probably similar in composition to some of those described above, i. e., a special mixture of soap or Turkey Red oil, with or without solvents, possibly very slightly alkaline. It is used both as a pretreatment or scour before dyeing, and in the SRA dye bath as an aid to leveling and penetration. In use, it is merely diluted with hot soft water and added to the soap scour or dye bath in the proportion of 0.5 to 5.0 c.c. per liter. These baths are used in the same manner and at the same temperature as those without the Celascour. After the operation the acetate silk should be rinsed free of soap with soft water.

THE SRA DYES

Table No. XXX gives information regarding the fastness of the SRA dyes on Celanese. The light fastness tests were made against Indanthrene and Caledon vat dyes, and the washing tests against dyes such as the Chlorazol Fast, Dianine Fast and Benzo Fast types.

TABLE NO. XXX

Fastness Properties of the SRA Dyes on Celanese

Dye	Light	Soaping	Organic Acids	Alkalies
SRA Pure Yellow I.....	G.	G.	E.	E.
SRA Pure Yellow II.....	G.	E.	E.	E.
SRA Golden Yellow VIII..	V.G.	V.G.	E.	E.
SRA Golden Yellow IX....	V.G.	V.G.	V.G.	E.
SRA Golden Orange I.....	E.	V.G.	E.	F.G.
SRA Orange I	V.G.	E.	E.	E.
SRA Orange II	G.	V.G.	E.	E.
SRA Pink II (recommended for underwear only).....	F.	G.	G.	..
SRA Red I	G.	E.	E.	E.
SRA Red III	G.	E.	E.	E.

SRA Red V	G.	E.	E.	E.
SRA Heliotrope I	E.	V.G.	E.	E.
SRA Violet II	V.G.	V.G.	E.	E.
SRA Blue III	E.	V.G.	E.	E.
SRA Blue IV	V.G.	V.G.	E.	E.
SRA Blue V	G.	V.G.	E.	E.
SRA Black IV (*B*-hydroxy-naphthoic acid)	E.	E.	E.	V.G.

R. G. Dort in *Chemicals 24*, No. 19, 19-22 (1925), recommends the following combinations of SRA dyes to obtain the various colors of best fastness to light:

Violet—
SRA Violet II.
SRA Heliotrope I.
SRA Blue IV.

Blue—
SRA Blue III.

Green—
SRA Golden Yellow VIII.
SRA Golden Yellow IX.
SRA Blue IV.
SRA Blue III.

Yellow—
SRA Golden Yellow VIII.

Orange—
SRA Golden Orange I.

Red—
SRA Heliotrope I.
SRA Red III.

Grays, Browns and General Mode Shades—
SRA Golden Yellow VIII.
SRA Heliotrope I.
SRA Blue III, or
SRA Golden Orange I.
SRA Red I.
SRA Blue III.

Navy—
SRA Blue III.
SRA Golden Yellow IX.
SRA Red I.

Black—
SRA Black IV, developed with *B*-hydroxynaphthoic acid.

The best fastness to soaping is obtained with:

Violet—
SRA Violet II.
SRA Heliotrope I.
SRA Blue IV.
SRA Red V.

Blue—
SRA Blue IV.

Green—
SRA Pure Yellow II.
SRA Blue IV.
SRA Golden Yellow IX.

Yellow—
SRA Pure Yellow II.
SRA Golden Yellow IX.

Orange—
SRA Orange I.
SRA Golden Yellow IX.

Red—
SRA Red I, III or V.
SRA Heliotrope I.

Grays, Browns and General Mode Shades—
SRA Golden Yellow IX.
SRA Red I.
SRA Blue III or IV.

Navy—
SRA Blue V.
SRA Red I or V.
SRA Golden Yellow IX.

Black—
SRA Black IV, developed with *B*-hydroxynaphthoic acid.

While SRA Orange I has a very good fastness to light, when used in mixtures and exposed to very bright light, it is phototropic (see AMERICAN DYESTUFF REPORTER, 1925, page 484, Part X) to some extent. It is therefore recommended only for pale mode shades. For full shades of brown, etc., it is best to use SRA Orange II, Red I or Heliotrope I. SRA Heliotrope I in some cases has a slight fluorescent effect, which is not always desirable. Where only pale shades are required, SRA Blues III and IV, Golden Orange I and Orange II, and Golden Yellows VIII or IX are widely used. Where medium shades are desired, the same blues, oranges and yellows are used, as well as SRA Red I. For deep shades of navy blue and brown, SRA Blue V, Golden Yellows VIII and IX, Orange II, and Reds I and V are recommended.

THE SRA BLACKS

In connection with SRA Blacks III and IV, discussed on page 519, of Part XI, SRA Black III gives a greenish-black with *B*-hydroxynaphthoic acid, instead of a bluish-black as previously stated. SRA Black IV is not recommended for use as a direct dye, but gives a variety of colors with different developers, as shown in Table No. XXXI. The light fastness of these developed colors vary somewhat, so that they should be tested before use. In developing the SRA Blacks on Celanese, it is recommended to diazotize and develop the base by the usual method for other fibers and colors, except that the developing bath should be hot, and when *B*-hydroxynaphthoic acid is used as the developer, the developing bath should distinctly acid to litmus. The addition of glue to the bath, while not essential, is usually advantageous. Method No. 135 covers the process.

(Continued on page 69)

Foreign Dyes Imported Through New York and Other Ports During December

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg. near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldo-f. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

FOREIGN dyes imported through New York and other ports during the month of December totaled 352,043 pounds, with an invoice value of $274,758. Imports by ports were as follows: New York, 348,187 pounds, with an invoice value of $273,227; Boston, 3,856 pounds, with an invoice value of $1,531.

Five Leading Dyes, by Quantity, Imported During December

	Pounds
Ciba Violet B, R (single strength)	62,832
Indanthrene Yellow (single strength)	12,480
Rhodamine 6G (single strength)	10,000
Rhodamine 6GDN (single strength)	10,000
Chlorantine Fast Brown	9,589

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Coal-Tar Dyes and Colors (pounds)	Coal-Tar Intermediates (pounds)
July 31, 1925	775,916	1,378,837
August 31, 1925	767,431	1,363,760
September 30, 1925	709,381	1,359,717
October 31, 1925	609,750	1,055,241
November 30, 1925	521,238	746,226

Per Cent of Dyes by Country of Shipment

	Dec.	Nov.	Oct.	Sept.	Aug.	July
Germany	44	47	72	62	51.5	57
Switzerland	43	47	10	21	36	32
Italy	4	1.5	3	3	4	2
England	3	1	5	3	3	3
France	2	0.5	3	2	3	1
Belgium	3	1.5	4	5	1	1
Canada	1	1.5	3	2	1	3

The total imports of synthetic aromatic chemicals for the month of December were 11,311 pounds, with an invoice value of $14,855.

The total imports of medicinals, intermediates, photographic developers and other coal-tar products for the month of December were 30,069 pounds, with an invoice value of $20,147. Imports of color lakes for the month of December totaled 3,772 pounds, with an invoice value of $2,588.

The dyes in this report are grouped by both Colour Index and Schultz numbers, and, in the case of those which could not be identified by either number, the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has

been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN*

Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
2	2	Nitrosine NN—(DH)	5
27	38	Orange Crystals—(B)	150
32	182	Brilliant Sulphon Red B—(S)	
104	..	Brilliant Sulphon Red 10B—(S)	2,000
104	..	Metachrome Olive Brown G Powder—(Bro.)	1,000
114	..	Guinea Fast Red 2R—(A-G)	500
130	121	Erika B Extra—(A-G)	100
138	134	Metanil Yellow ME—(P)	2
173	..	Metachrome Violet B—(A-G)	200
195	177	Alizarine Yellow GD—(S)	500
196	175	Silk Ponceau—(P)	2
225	194	Frident Red RXX—(B)	300
239	212	Fast Brown G—(A-G)	10
246	217	Naphthaline Black 12B—(P)	2
316	273	Diazamine Blue BR Conc.—(S)	5,004
319	273	Brilliant Fast Heliotrope 2RL—(By)	220
325	..	Diamine Brilliant Violet B—(C)	681
326	279	Benzo Fast Orange WS—(By)	
		Benzo Fast Scarlet 8BS—(By)	200
382	319	Chloramine Red 3B—(S)	2,000
409	339	Diamine Orange B—(C)	2,000
419	343	Direct Fast Red F—(P)	2
423	349	Diamine Brown B—(Q)	350
430	..	Polar Red RS Conc.—(G)	1,277
436	358	Acetopurpurine 8B—(A-G)	
		Chloramine Red 8BS—(By)	
		Toluylene Red Powder—(A-G)	1,605
440	360	Ignamine Orange—(B)	400
443	..	Acid Milling Red G Conc.—(G)	1,102
449	364	Diazo Brilliant Black B—(By)	1,000
459	373	Congo Orange R Powder—(By)	110
487	400	Acid Milling Red R Conc.—(G)	551
516	423	Diazo Indigo Blue BR Extra—(By)	320
561	449	Trisulphon Brown B Conc.—(S)	3,802
588	469	Chloramine Black N—(S)	100
596	476	Cupranil Brown G—(I)	771
598	477	Diphenyl Brown GS—(G)	551
629	207	Diphenyl Fast Brown GF—(G)	551
636	19	Kiton Fast Yellow 3G—(I)	551
658	496	Setoglaucine—(G)	1,102
663	500	Setopaline Conc.—(G)	60
667	503	Erioviridine B Supra—(G)	
		Patent Green AGL—(M)	
		Poseidon Green SGX—(B)	2,102
677	512	Diamond Magenta I—(B)	
		Magenta AB Powder—(B)	550
681	516	Crystal Violet Extra Powder—(B)	1,500
698	530	Acid Violet 5BE—(P)	2
707	539	Soluble Silk Blue 6B—(P)	2
712	543	Patent Blue V—(M)	550
714	545	Brilliant Acid Blue A—(By)	
		Patent Blue A—(M)	
		Poseidon Blue BR Extra—(B)	
		Poseidon Blue BXX—(B)	2,864
715	546	Cyanol Extra—(C)	
		Cyanol FF—(C)	1,448
717	548	Acid Violet 6BNG—(G)	103
718	549	Brilliant Chrome Violet 4B—(DH)	441
735	564	Alkali Fast Green 3G—(By)	
		Erio Green B Supra—(G)	1,687
748	579	Sulpho Rosazeine B Extra—(M)	320
749	573	Rhodamine B Extra (s. s.)—(B)	
		Rhodamine B Extra (s. s.)—(A-G)	2,750
752	571	Rosazeine 6G Extra (s. s.)—(M)	
		Rosazeine 6GD Extra (s. s.)—(M)	10,000
788	603	Acridine Orange DHE—(DH)	
		Brilliant Acridine Orange A—(DH)	1,543
789	..	Patent Phosphine G—(I)	110
793	606	Phosphine 3R—(A-G)	2,000
797	608	Euchrysine RRDX—(B)	
		Patent Phosphine GRNTN—(B)	
		Patent Phosphine RRDX—(B)	1,744
801	613	Quinoline Yellow Extra—(B)	200
813	198	Mimosa Z Conc.—(G)	225
814	617	Chloramine Yellow FF—(S)	200
829	673	Rosinduline 2B Bluish—(K)	500
833	..	Wool Fast Blue BL—(By)	
		Xylene Fast Blue AE Conc.—(S)	1,553
845	687	Rosolane Paste—(P)	50
865	700	Silver Gray P—(A-G)	25
873	681	Direct Gray R Paste—(G)	2,326
875	923	Fur Blue Black A, SB—(A-G)	
		Fur Brown NZ, 4R—(A-G)	
		Fur Gray G—(A-G)	
		Fur Yellow 4G—(A-G)	
		Fur Yellow Brown A—(A-G)	735
878	622	Brilliant Delphine Blue B—(S)	1,000
879	..	Chromazurine E Powder—(DH)	
		Chromazurine G—(I)	
		Chromazurine GR—(DH)	1,438
884	627	Anthracyanine BGC—(DH)	
		Anthracyanine SR—(DH)	
		Modern Cyanine RX—(DH)	
		Modern Cyanine V—(DH)	20
890	633	Indalizarine J Paste—(DH)	5
892	633	Modern Violet—(DH)	
		Ultra Violet MG—(S)	941
894	637	Gallamine Blue Extra Paste—(G)	6,359
900	641	Coreine RR No. 65—(DH)	5
905	645	Gallazine No. 90—(DH)	441
924	660	Methylene Green W—(G)	3,304
925	661	Methylene Blue HGG—(B)	
		Thionine Blue GO—(M)	900
1019	774	Alizarine Black S Paste—(B)	1,398
1027	778	Alizarine Paste Bluish—(I)	
		Alizarine VI Extra Pure—(B)	4,299
1033	779	Alizarine Orange AO Paste—(BD)	
		Alizarine Orange R Paste—(M)	2,000
1034	780	Alizarine Red IWS Powder—(M)	
		Alizarine Red S Powder—(B)	1,477
1053	..	Alizarine Blue WS—(By)	635
1054	858	Alizarine Sapphire Blue B—(I)	880
1060	801	Anthracene Blue SWGG Powder—(B)	100
1061	802	Anthracene Blue WG Paste—(B)	840
1063	790	Anthracene Blue SWR Powder—(B)	500
1067	804	Alizarine Blue S Powder—(B)	700
1073	852	Alizarine Blue Jr. Powder—(By)	110
1075	856	Alizarine Blue AS Powder—(By)	1,111
1076	859	Alizarine Direct Blue RXO—(B)	
		Alizarine Light Blue R Conc.—(S)	364
1078	865	Alizarine Cyanine Green G Extra—(By)	
		Alizarine Light Green GS Conc.—(S)	1,625
1080	853	Anthraquinone Violet Powder—(B)	600
1081	864	Anthraquinone Green GXNO—(B)	357
1084	854	Alizarine Viridine FF Paste—(By)	6,000
1085	862	Alizarine Blue Black B Powder—(M)	1,000
1088	855	Alizarine Sky Blue B Powder—(By)	518

*This table includes imports through the port of New York to the amount of 348,187 pounds, and also 3,856 pounds through the port of Boston.

Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
1091	..	Anthra Rubine B Powder—(K)	274
1095	759	Anthra Yellow GC Paste—(B)	
		Anthra Yellow GC Paste Fine—(B)	
		Anthra Yellow GC Powder—(s. s.)—(B)	
		Anthraflavone GC Paste—(B)	5,022
1096	760	Vat Golden Orange G Double Paste Fine (s. s.)—(B)	2,852
1097	761	Vat Orange RRT Paste—(B)	3,889
1099	763	Vat Dark Blue BOA Paste Fine—(B)	4,347
1102	765	Anthra Green B Powder (s. s.)—(B)	200
1104	767	Vat Violet RR Ex. Dbl. Pst. (s. s.)—(B)	441
1106	838	Vat Blue RSB Triple Powder (s. s.)—(B)	1,800
1109	840	Vat Blue 3G Double Paste (s. s.)—(B)	
		Vat Blue 3G Paste—(B)	1,953
1110	841	Vat Blue GGSZ Double Paste (s. s.)—(B)	1,950
1113	842	Cibanone Blue GCD Dbl. Pst. (s. s.)—(I)	
		Vat Blue GCD Dbl. Pst. Fine (s. s.)—(B)	
		Vat Blue GCDN Powder (s. s.)—(B)	6,706
1114	..	Helindone Blue IBCS Powder (s. s.)—(M)	2,500
1115	843	Cibanone Blue G Paste—(I)	441
1118	849	Vat Yellow G Double Paste (s. s.)—(B)	
		Vat Yellow G Dbl. Pst. Fine (s. s.)—(B)	12,480
1120	867	Anthra Brown B Paste—(B)	425
1129	815	Algol Scarlet G Powder (s. s.)—(By)	160
1132	817	Vat Yellow GK Paste—(By)	400
1135	820	Vat Brilliant Violet RK Powder (s. s.)—(B)	400
1143	827	Vat Bordeaux B Extra Powder (s. s.)—(B)	160
1150	833	Vat Olive B Paste—(GrE)	1,102
1151	..	Vat Brown R Paste—(B)	
		Vat Brown R Paste—(By)	
		Vat Brown R Powder—(By)	
		Vat Brown IR Paste—(M)	4,136
1152	..	Vat Bron B Powder (s. s.)—(GrE)	
		Vat Brown G Paste—(By)	1,918
1162	831	Vat Red BN Extra Paste—(B)	1,364
1163	832	Vat Violet BN Paste Fine—(B)	287
1178	876	Indigosol OR Powder	110
1184	881	Indigo MLB/4B Powder (s. s.)—(M)	
		Brilliant Indigo 4B Paste—(B)	6,025
1188	884	Brillian tIndigo BB Paste—(B)	1,991
1207	912	Anthra Red B Paste—(B)	
		Ciba Pink B Paste—(I)	1,523
1209	917	Helindone Red B Powder—(s. s.)—(M)	130
1211	910	Anthra Pink AN Paste—(B)	900
1211	910	Thioindigo Rose BN Extra Paste—(K)	1,490
1212	918	Vat Red Violet RH Paste—(B)	
		Vat Red Violet RH Paste for Printing—(B)	2,102
1215	914	Helindone Orange DIPowder (s. s.)—(M)	350
1217	913	Helindone Orange R Powder (s. s.)—(M)	
		Hydron Orange RF Paste—(C)	
		Thioindigo Orange R Paste—(K)	
		Vat Orange RF Paste—(C)	2,876
1222	901	Ciba Violet B Paste—(I)	
		Ciba Violet B Powder (s. s.)—(I)	
		Ciba Violet R Paste—(I)	
		Ciba Violet R Powder (s. s.)—(I)	62,832
1226	906	Ciba Red G Powder (s. s.)—(I)	3,310
1227	904	Thioindigo Brown G Paste—(K)	1,002
1228	907	Anthra Scarlet GG Paste—(B)	
		Ciba Scarlet G Extra Paste—(I)	
		Thioindigo Scarlet 2G Ex. Pst.—(K)	7,897
1229	908	Ciba Red R Paste—(I)	1,322

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Blue AM—(By)	652
Acid Milling Yellow G Conc.—(S)	500
Alizarine Direct Violet E2B—(M)	500
Alizarine Leveling Blue OA—(C)	100
Astra Phloxine FF Extra—(By)	100
Brilliant Acid Blue EG—(By)	100
Erio Fast Cyanine Green G—(G)	150
Guinea Brown 2R—(A-G)	10
Indocyanine B—(A-G)	
Indocyanine B—(By)	4,240
Ink Blue BITBN—(GrE)	
Ink Blue BJTBN—(A-G)	
Ink Blue BITBNOO—(I)	389
Kiton Fast Red BL—(I)	110
Milling Red 6BA—(A-G)	100
Milling Yellow GA—(A-G)	300
Milling Yellow F3G—(A-G)	200
Neolan Yellow GR—(I)	551
Naphthalene Black ABP—(P)	2
Polar Red B Conc.—(G)	660
Radio Black SB—(C)	100
Silk Blue BSIC Powder—(A-G)	200
Soluble Blue T—(B)	100
Sulpho Rhodamine BGG—(M)	513
Sulphon Orange G—(By)	223
Wool Black GRF—(A-G)	2,000
Wool Violet RC—(G)	220
Xylene Milling Blue GL Conc.—(S)	1,000

Vat Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Algol Brilliant Pink FB Powder (s. s.)—(By)	800
Anthra Brilliant Green 5G Paste—(B)	330
Ciba Blue 2BL Powder—(I)	22
Cibanone Orange 6R Paste—(I)	220
Eridan Scarlet R Paste—(K)	550
Grelanone Red 2B—(A-G)	
Grelanone Scarlet G Powder (s. s.)—(A-G)	25
Grelanone Red 2B Powder (s. s.)—(A-G)	25
Helindone Pink R Extra Paste—(M)	5,000
Helindone Printing Black RD Paste—(M)	4,000
Helindone Printing Black IBR Paste—(M)	2,000
Hydron Brown G Powder (s. s.)—(C)	
Hydron Brown R Paste—(C)	2,884
Hydron Green B Paste—(C)	100
Hydron Scarlet 3B Paste—(C)	1,839
Hydron Sky Blue FK Paste—(C)	1,014
Indigosol Yellow HGG Powder—(DH)	110
Vat Blue RZ Double Paste (s. s.)—(B)	2,586
Vat Blue Green B Double Paste Fine (s. s.)—(B)	1,992
Vat Brilliant Violet RRP Powder—(B)	330
Vat Brown 2G Paste—(B)	551
Vat Green 2G Double Paste (s. s.)—(B)	882
Vat Orange 4R Powder (s. s.)—(B)	360
Vat Pink B Double Paste (s. s.)—(B)	
Vat Pink B Powder (s. s.)—(B)	944
Vat Red Brown R Paste Fine—(B)	975
Vat Black 2B Paste—(GrE)	425
Vat Printing Brown R Paste—(By)	4,000
Vat Yellow GF Powder—(By)	10

Mordant and Chrome Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Alizarine Gray G—(M)	263
Brilliant Chrome Blue PR—(DH)	5
Brilliant Chrome Blue PV—(DH)	5
Brilliant Chrome Violet B—(DH)	5
Brilliant Chrome Violet 3RA—(DH)	5
Chromanol Black RVI—(DH)	110

Name of Dye and Manufacturer	Quantity (pounds)
Chromazurine NS, R, RN, RR—(DH)	20
Chrome Blue BR—(DH)	5
Chrome Brown VR—(DH)	5
Chrome Deep Brown RN—(DH)	5
Chrome Green DG—(DH)	5
Chrome Olive JGSS—(DH)	5
Chrome Orange N—(DH)	15
Chrome Printing Red B Powder—(I)	220
Chromochlorine E, EN—(DH)	10
Chromocitronine 3R Powder—(DH)	220
Chromophenine RP—(DH)	5
Chromophosphine EFN—(DH)	5
Chromopurpurine JJ—(DH)	5
Chromorhodine 6GS Extra—(DH)	5
Chromorhoduline B—(DH)	5
Chromosafranine B—(DH)	5
Coerulein SIC—(DH)	5
Coreine MS—(DH)	5
Eriochrome Brilliant Violet B Supra—(G)	110
Eriochrome Red G—(G)	2,204
Eriochrome Violet B—(G)	551
Eriochrome Violet 3B—(G)	110
Fast Chrome Green BN—(DH)	5
Modern Brown—(DH)	5
Modern Gray DH, PS—(DH)	10
Direct Dyes	
Benzo Fast Black L—(By)	450
Benzo Fast Brown RL—(By)	500
Benzo Fast Heliotrope 5RH—(By)	100
Benzo Fast Violet BL—(By)	297
Benzo Rhoduline Red 3B—(By)	573
Brilliant Benzo Fast Yellow GL—(By)	100
Brilliant Congo Blue 5R—(A-G)	100
Brilliant Sky Blue 8G Extra Powder—(By)	551
Chlorantine Fast Blue 2GL—(I)	1,102
Chlorantine Fast Brown 5GL—(I)	
Chlorantine Fast Brown RL—(I)	9,589
Chlorantine Fast Green B—(I)	551
Chlorantine Fast Red 5BL—(I)	110
Chlorantine Fast Violet 5BL—(I)	4,409
Chlorantine Fast Yellow 4GL—(I)	1,322
Chlorazol Fast Brown RK—(BD)	500
Columbia Catechine G—(A-G)	500
Developed Blue 4GL Extra Powder—(By)	551
Developed Brilliant Scarlet 2BL Extra Conc.—(By)	1,249
Developing Blue B—(A-G)	500
Diamine Azo Brown G—(C)	507
DiamineAzo Fast Green G—(C)	1,006
Diamine Azo Fast Violet R—(C)	1,441
Diamine Azo Yellow 2G—(C)	507
Diamine Catechine B—(C)	110
Diazo Fast Blue 4RW—(I)	551
Diphenyl Fast Bordeaux BC—(G)	110
Diphenyl Fast Bronze B—(G)	551
Diamine Fast Orange ER—(C)	500
Diamine Neron BB—(C)	50
Diaminogene GG—(C)	2,461
Diazo Sky Blue 3GL—(By)	1,170
Direct Fast Brown 3GL—(By)	551
Fast Cotton Gray VL—(A-G)	500
Formal Fast Black G Conc.—(G)	220
Isamine Blue R—(C)	200
Rosanthrene Fast Bordeaux 2BL—(I)	661
Zambesi Pure Blue 4BG—(A-G)	200
Dyes for Artificial Silk	
Dispersal Yellow 3G Paste—(BD)	60
Duranol Orange G Paste—(BD)	56
Setacyl Direct Orange G Powder—(G)	220
Setacyl Direct Orange 2R Powder—(G)	220
Setacyl Direct Yellow R Powder—(G)	220
Sulphur Dyes	
Indo Carbon SN—(C)	50
Pyrogene Cutch 2R Extra—(I)	551
Thionol Brown O—(BD)	2,240
Brilliant Rhodamine Blue R—(By)	676
Euchrysine GX—(B)	430
Rhodamine 6GDN Extra (s. s.)—(B)	10,000
Thionine Sky Blue 6B—(Q)	10
Toluidine Blue—(B)	5
Color Lake Dyes	
Helio Fast Carmine CL Powder—(By)	25
Helio Red RMT Extra Powder—(By)	231
Stone Fast Yellow GN Pieces—(B)	100
Stone Fast Yellow GN Lumps—(B)	300
Unclassified Dyes	
Brilliant Alliance Blue—(DH)	5
Green B—(B)	20
Naphthol Ciba R—(I)	661

BOOKLET ON EVERDUR METAL

The Du Pont Everdur Company, of Wilmington, Del., has just issued an attractively printed and illustrated booklet describing in detail important facts about Everdur metal, its new product. Everdur is a corrosion-resistant alloy with physical properties characteristic of steel and was developed by the Du Pont Company to meet corrosion problems existing in some of its own operations which involved the use of hydrochloric acid, the corrosion-resistant alloys and metals available on the market not having been found sufficiently resistant to be of service for the construction of plant equipment in these operations.

In discussing the metal, the booklet states, "Further tests developed the fact that Everdur was resistant in a greater degree to a larger number of corroding agents than other corrosion-resistant alloys on the market, had a tensile strength and elastic limit considerably above acid-resistant bronzes (comparable with steel), made sound castings, possessed excellent machining and working qualities, and could be fabricated into the various forms obtainable from steel, including wire and seamless cold drawn pipe and tubing."

The new metal is described as an alloy of copper, silicon, and manganese, of the solid solution type, which because of its homogeneity is recognized as the type of alloy most desirable for resistance to corrosion.

The booklet is full of interesting data on corrosion and the details of the resistance of Everdur to various acids. The working qualities of the metal are explained, how it is cast, how it should be melted and poured, the preparation of molds, and other information necessary for customers.

Proceedings of the American Association of Textile Chemists and Colorists

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NOVEMBER MEETING OF THE NEW YORK SECTION

The November meeting of the New York Section of the American Association of Textile Chemists and Colorists convened at the Machinery Club, New York, on Friday evening, November 20, at 8.15 o'clock, Herbert Grandage presiding.

After the regular business of the Section had been transacted, Chairman Grandage introduced the first speaker.

Chairman Grandage—We have with us to-night M. E. Tice, of the Dutchess Bleachery, who is going to present the first phase of our subject this evening, "Vat Colors." He will speak to us on "Vat Dyes on Cotton." Mr. Tice has told me that he will very gladly entertain any questions in connection with his paper during the time that he is talking. His time is somewhat limited, as he must drive back to Wappinger Falls to-night, and if you care to ask him questions he will be glad to have you do so during the course of his talk; he will not consider them as interruptions.

Mr. Tice! (Applause.)

Vat Dyes on Cotton

By M. E. TICE
Dutchess Bleachery

Mr. Chairman and Gentlemen: I certainly appreciate the invitation to come down here and talk to you on the application of vat colors to cotton piece goods. I don't know as yet whether I am grateful or not. This is my initial attempt at talking publicly; and in the second place, I haven't made any special preparation—I have been too busy, I am sorry to say; and in the third place, I am unable to tell you what I would like to tell you about the application of vats to cotton piece goods, because at the Dutchess Bleachery we have developed a method that we are trying to patent, and so far we have made some progress along that line.

When I left the Dutchess Bleachery this afternoon I had no idea as to what I would say to you, but on the way down it occurred to me that perhaps the best thing I could do would be to say something that is not in any of the current literature on the application of vat colors. I thought perhaps it might be well to have a blackboard here and talk with the aid of a blackboard; but, unfortunately, we can't have that. So perhaps what I have to say may not be quite clear to you, as I have made no preparation for it whatever; therefore, if you will ask questions on anything you don't understand I will be glad to answer them.

I will try to give you three distinct methods of applying vat colors to cotton piece goods.

DYEING LIGHT SHADES

Suppose, in the first place, that a customer here in New York has sent an order to your mill for 4,000 yards of cotton piece goods to be dyed a light shade, vat blue guaranteed fast to sunlight and fast to washing. Here is what I would do—no, I won't say it is what I would do, but it is the next best process that I know of. (Laughter.)

I would take an ordinary padder—here is where the blackboard would come in handy—and I would have the rolls about 14 inches in diameter, the bottom roll medium hard and the top roll a little softer. Around the bottom roll I would place a pan the same shape, curved about 1 inch from the bottom roll about halfway up. On a 48-inch machine or 50-inch machine, that would hold about 3 gallons. I would rig it up with a bar under which the cloth would pass, just in front of the dips, below the level of the dye, and I would feed the liquor in from a "T"-shaped pipe from the back.

The speed of the machine would be about 40 to 60 yards per minute; that is, the machine proper, rigged with a batcher on the back.

For making up the liquor, a 160-gallon tank is about the right size. Whether it is a light shade or not, we must consider that the caustic and hydro and our dispersing agent are not based so much on the quantity of the dyestuff as on the volume of the liquor.

I have found from past experience that 160 gallons of water for any amount of dyestuff, from 1 pound to 30 pounds, requires at least 8 pounds of caustic and 8 pounds of hydro, and the dispersing agent that I have found to be the best is glue, about 6 pounds.

The way I would make up the tank would be first to put in the caustic, dry caustic—ground caustic is the easiest to handle, I believe—and boil that, along with the glue; then, in about a quarter of the tank bring up the water until the temperature is down to the temperature required for the dyestuff. If it happens to be blue I would boil that to 120-140. Then I would put in the hydro—put it in slowly, while stirring—and put in the paste that had just been boiled. I would then bring the volume up to a full tank, bringing the temperature down to 100 or below, which I find is the best temperature at which to do the dyeing.

I have found that if the temperature remains the same as that used for reducing, the vat doesn't last as long as you might want it to. If you don't get the shade first and have to make any additions, it may be an hour or two before you can get your shade, and if the temperature is too high it falls out of solution very readily after you have started to run.

It seems that in such a short bath you get the penetration without the heat. I have found that a bath, after it has been reduced, will stand up four or five hours, provided it is kept under 100 deg. Fahr.

When the cloth is passed through the padder, I think it is best to batch it up on the back. If it were batched hot, or at 120 to 140, the outside edges, of course, would cool and oxidize a great deal quicker than the center, and when your batch was finished you would find that the edges for probably 3 or 4 inches on both selvages would be a different shade than the center. Blues would be redder, and so would helios; and if they were dropped into a box, instead of different color on the selvage you might find large blotches throughout the cloth. When this is batched cold it doesn't happen.

Of course, the color of the cloth, after it goes through the padder, is not fast to washing by that method. The way to fasten is to take it on a set of jigs and reduce it at the temperature that the dyestuff best reduces at, give it six ends—that is about enough; that would take approximately an hour—then a couple of cold waters. I have found it best to oxidize it with about a pound of chrome, acetic acid at about 140, then two more waters. Then take it off the jigs and soap it any way you like.

That is a method I would recommend for light shades.

E. S. Chapin—If it isn't fast, why do you pad it? Why not start on the jigs?

Mr. Tice—For this reason: If you put it on the jigs and try to dye it a light shade, all the imperfections in the cloth show up. If the warp is woven loosely in places and tight in others, the construction of the cloth isn't entirely uniform; all those things seem to show up. It makes a very poor job. That would be from dyeing proper. But in the padding it seems to go on quite level.

Dyeing Medium Shades

For medium shades, I think the best method is the pigment method. For that method, I think it is best to use a different type of padder. You can run it at any speed from 120 to 220 yards per minute. The type I would use for padding in the pigment would be a padder like the other, with the exception that the bottom roll would be around 18 or 20 inches in diameter; and a "U"-shaped box underneath is preferable, I think, so that the roll will carry up or slop up enough liquor to go on the cloth.

In this case, I think it is best to run straight in the nip rather than immerse the cloth, because otherwise you are liable to get foam spots. And the bar that the cloth is to go under just before the nip should be preferably a board, so that when any seams go through the dye won't spatter back on the cloth. It makes very peculiar marks if it spatters back on the cloth too far. That would form a small bath on the top of the cloth as well as underneath. The cloth should be batched up exactly the same as the other, with the pigment on; that is, the same as dyeing with a reduced color.

In making up your pigment bath I have found British gum to be about the best. Take the pigment and grind it in to make sure that all the color is free from specks. Make it up in a tank, preferably with a steam coil, and agitate it to keep it uniform, to keep it from settling.

When the cloth is padded through and batched up, it is taken immediately to the jigs without drying—it isn't nec-

essary to dry it—and given two warm waters before starting to reduce. I find that the water will wash off to a great extent any specks that might be on the cloth. Then the reducing is carried out in a long bath, full jig of water, with about 4 pounds of caustic and hydro. The first two ends it is better to run cold. If you run them hot, it seems as though the hot dyestuff runs off the edges and makes light selvages. If you give two ends cold it sets it so that when you reduce it to the temperature required the piece is fairly uniform.

I have found, however, that no matter how careful we are, 4 or 5, probably 10, sometimes 20, yards on each side of the roll are blotchy and spoiled. I have never been able to overcome that. Neither have I been able to overcome all the light selvages.

I suppose you might think that you could dye medium shades in a reduced bath, but it is mighty expensive. It is a great deal cheaper to dye in the pigment. It seems as though when you get up above 5 or 10 pounds to 100 gallons and add another 5 pounds, say, to a 10-gallon shade, it doesn't make 50 per cent difference. You don't get the value out of the padder, and you do when dyeing in the pigment form.

Are there any questions regarding the pigment method?

Jig Method for Heavy Shades

There is one other method I want to speak of, and that is the jig method for very heavy shades. That process is well known to most of you, I suppose. I usually take a regular size roll, 1,000 yards of cloth (using gray cloth), boil it up well, 4 to 6 ends on the jigs, and then, the shade being very heavy, it requires about the same amount of dyestuff for all the Indanthrene groups, or any group of the same class.

We might take, for instance, a shade of Navy Blue and dye it with Hydron Blue, Hydron W, G or R, and it will give a fairly satisfactory Navy. Take 1,000-yard roll, as I said before, and boil it down, with about 15 pounds of dye. Boil it 7½ pounds to each pail (we couldn't get it all in one pail) and put it in the jig (a full jig this time, too), with about 8 pounds of hydro, 6 of caustic, and a couple of quarters of soluble oil. Give the roll one bath through that mixture to drive out the hydrogen, and then put in one pail of dyestuff. Stir it until it is reduced, and give one end, letting the roll swing, until you can add the second portion of dyestuff. When that is added and you have waited five or ten minutes for that to reduce, the second end is given.

On the third, fourth, fifth and sixth ends you are still giving salt to drive on the color. It is better to add about a pound of hydro, lessening the alkalinity, and therefore driving it on slowly. If salt is used, I find it has a tendency to bronze considerably, and the hydro doesn't do that. At the same time it keeps the bath in good condition.

It is better to establish a formula and get your batch off as quickly as possible. Otherwise you are likely to get oxidized selvages, bronzy edges. So immediately after the six or eight ends that are required to get the shade, give a couple of cold waters, right in the chrome and acetic, which I have found to be the best method of oxidation.

When we dye navies or heavy shades, we usually take them off the jigs at that point and mercerize them. It is pretty hard when they don't call for mercerized finish, but we find that mercerizing stops rubbing and crocking, and gives a deep, beautiful shade.

I think that is all I can tell you about the three different methods. That is all I had in mind to say. Are there any more questions to ask? If there are I will be glad to answer them at this time.

Discussion on Vat Dyes on Cotton

G. A. Hayes—Why do you mercerize after dyeing instead of before?

Mr. Tice—To prevent rubbing, and to improve the appearance. Sometimes it is rather dull. Mercerizing not only decreases the amount of rubbing, but it gives a very good appearance to the cloth.

Mr. Hayes—Doesn't it give that appearance if it is mercerized first?

Mr. Time—If you mercerize first your dyeing is not as level or as uniform.

Chairman Grandage—You made no mention in your remarks about dyeing light and medium shades whether those were dyed on bleached cloth or gray cloth.

Mr. Tice—The light shades and medium shades are all dyed on bleached cloth.

S. F. Carter—I would like to ask a question: In regard to oxidizing with chrome and acetic, Hydron Blue, did you find that gave as good a shade as oxidizing with perborate?

Mr. Tice—Yes. After mercerizing, the cloth is washed and soured, and then is given a good soaping in the bleachhouse with perborated soap. That reddens the shade.

Chairman Grandage—Does that finish your questions on the application of vat colors to cotton? If so, perhaps we had better pass on to our next paper.

Dr. E. H. Killheffer—Before Mr. Tice goes I move that we extend him a vote of thanks.

. . . The motion was carried by a unanimous rising vote. (Applause.)

Chairman Grandage—The next phase of the subject of the evening will be presented by Jean Kern, of E. I. du Pont de Nemours & Co., who has selected for his subject, "The Discharge of Vat Colors." Mr. Kern. (Applause.)

. . . Mr. Kern presented his prepared paper:

Proceedings of the American Association of Textile Chemists and Colorists

Discharge of Vat Colors by Reduction

By JEAN KERN

E. I. du Pont de Nemours & Co.

It is not my idea to talk to you this evening about direct vat color printing, as I am very well aware that most of you have a far-reaching experience on this subject. On this occasion I wish to take up with you the subject of the discharge of vat dyes by reduction, a subject which I believe to be of very great interest to the American textile industry, and to express my thanks to the committee for the invitation to do so. Also, I do not intend to cite discharge processes which are in daily use in our mills, but to pass shortly in review the properties of the vat dyes in their relation to dischargeabiilty and the utilization of these properties for a possible practical application.

In the limited time at my disposal I do not propose to take up the discharge of Indigo, which ranges now among the oldest processes of this type of work, and shall limit these few words strictly to indigoids, anthraquinone vats and sulphur dyes which to-day still offer real difficulties and whose discharge problem is not in the least solved as yet.

According to their relation with indigoids or anthraquinone derivatives the vat dyestuffs behave very differently when reduced in the presence of Rongalite CL (leucotrope). In his research on reducing discharge agents for vat colors, Bude (F. Z., 1912, 470) divided them into four main groups according to their discharge with Rongalite CL.

The discharge paste used by Bude in the testing of these colors is composed as follows:

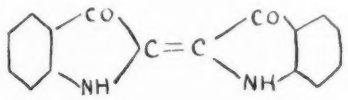
Hydrosulphite NF Conc.
Zinc Oxide
Anthraquinone
Glycerine
Benzyl Chloride $C_6H_5CH_2Cl$

With this mixture the reduction has been found much quicker than with any other reducing combination. After printing, the stabilized leuco compound is simply removed by a passage in a boiling solution of caustic soda (10 c.c. caustic soda 40 deg. Be. per liter) in order to get a discharge effect.

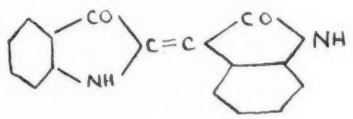
The four groups can, then, be classed as follows:

Group No. 1—Very easily reducible.
Group No. 2—Difficultly reducible.
Group No. 3—Very difficult to reduce.
Group No. 4—Not reducible.

The first group should include Indigo and its derivatives of the general formula:



These are the natural indigo and synthetic, the brominated and chlorinated indigoes (Brilliant Indigo 4B, Ciba Blue 2B, Indigo Blue MLB R, 2R, 2B, 3B, etc.). In the same group are included all the substitution products of Indorubine,



such as Heliotrope Ciba B, which is a tetra-brom-Indorubine. The halogen derivatives of Indorubine, however, are less dischargeable the more their molecule is halogenated; but without any exceptions all these dyes enter a reaction identical to that of Indigo with Rongalite CL; that is, by the action of leucotrope on the leucos, and in the presence of zinc oxide, benzylated derivatives are formed, whose colors vary from yellow to yellow-orange. These benzylated compounds are insoluble if obtained with Leucotrope O; soluble with Leucotrope W. These ethers are stable if exposed to air. However, one can observe a difference in their solubility as well as in their ease of entering the benzylation reaction, a characteristic of the dye. Quite a few processes for the production of white effects were in use shortly after the appearance in the trade of these dyes: for example, white discharge on grounds dyed with Brilliant Indigo, Ciba Blue, etc. These processes do not offer any particular difficulty. The discharge pastes for brominated indigos contain only a higher content of leucotrope and also a higher alkalinity.

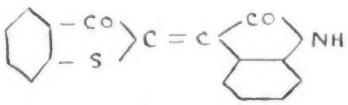
No. 1	Parts	No. 2 B.A.S.F	Parts
British Gum	410	Thickener	410
Rongalite CL	250	Soda Ash	100
Rongalite C	50	Zinc Oxide 1:1	180
Zinc Oxide 1:1	150	Chalk	40
Soda Ash	100	Leucotrope W Conc.	140
Anthraquinone 30%	40	Rongalite CL	120
		Oil (Olive)	10
	1,000		1,000

Group No. 2 comprises the vat dyes of the thioindigo series, and here also we have to differentiate between whether they are symmetrical or asymmetrical.

Symmetrical Asymmetrical

In the category of the symmetrical thioindigoes we have: Thioindigo Red B, Helindone Scarlet R (di-brom-di-ethoxy-thioindigo), Helindone Red B (dichlor-thio-indigo), Helindone Red 3B (dichlor-di-methyl-indigo), Ciba Bordeaux B, Helindone Orange R and D, etc.

Among the asymmetrical thioindigoes we have Ciba Violet B (tri-brom-2-thionaphthene-2-indol-indigo), Ciba Violet 3B. To the same group are connected the dyes of thionaphthene-indol-indigo type,



such as Thioindigo Scarlet R and its di-brominated derivative, Ciba Red B, and Thioindigo Scarlet G. These dyes, as a rule, are very difficult to discharge. However, those which contain in their molecule a sulphur and nitrogen atom (asymmetrical type) will reduce and discharge more easily than those of the symmetrical type and its halogenated derivatives.

Reinking long ago established that the dyes derived from Indigo formed insoluble benzylated compounds of intense yellow to orange color with Leucotrope O. This has been applied for color discharge. The thioindigo vats, however, give colorless products, and this enables one to obtain with Leucotrope O a white discharge with thioindigo red dyed grounds. Before the appearance of the leucotrope many mills tried to discharge thioindigo by using the old Indigo discharge process with hydrosulphite-formaldehyde. To do this, and in order to retard the reoxidation of the leuco thioindigo, it is necessary to print a very alkaline Rongalite C paste. The reduced dye is then removed from the fiber by a treatment in water containing Rongalite or hydrosulphite and soap. Quite a few Russian mills, for example, worked with this method quite successfully for discharges on Thioindigo Red, Helindone Orange R and Thioindigo Scarlet.

The Kalle Company (D. R. P. 200,927—212,792—F. Z. 1910, 275; Fischer, 1908, 396) recommends the passage in the cold in diluted acid followed by a treatment in hot diluted caustic. The same firm calls attention to a process (F. Z. 1910, 287) consisting of a treatment with slightly acidulated diluted alcohol, and points out the necessary use of anthraquinone in the discharge paste (D. R. P., 213,583). Print, for example:

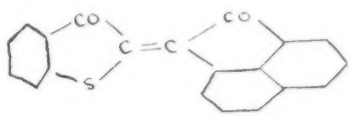
200 grams Hydrosulphite NF
200 grams water
550 grams British gum
50 grams Anthraquinone Paste 30%

1,000

After printing, age and after-treat with alcohol, 250/1,000, to which 10 per cent HCl is added. The passage in this bath takes about two minutes at 40 deg. Cent.

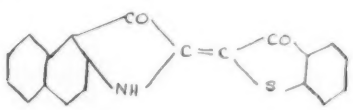
Thioindigo Red can also be discharged with stannous oxide (F. Z., 1910, 287). The discharge paste contains stannous oxide and caustic soda. The after-treatment consists of a passage in diluted boiling caustic soda solution. Furthermore, glucose or other carbon hydrates are recommended by the B. A. S. F. for Thioindigo Red discharge (D. R. P. 214,715, F. Z., 1910, 287).

The third group comprises the dyes obtained by the condensation of acenaphthene-quinone with oxy 3-thio-naphthene.



To this type belong Ciba Scarlet G (thionaphthene-acenaphthene-indigo), Thioindigo Scarlet 2G and Ciba Red R, which is the brominated derivative of Ciba Scarlet G.

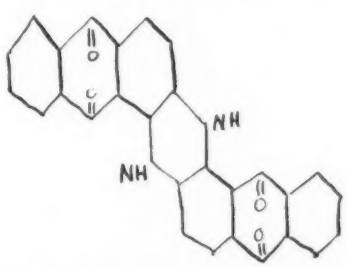
Here also belong the halogen derivatives of the condensation products of oxy-thionaphthene with the derivatives of the Isatines of the naphthalene series. All have the nucleus:



i. e., Ciba Gray B, Helindone Gray 2B.

The reduction of dyes which have a naphthalene nucleus is always very difficult, but possible. The reducing agents must be allowed to react for a longer time; that is, the aging must be carried on for at least ten minutes and it requires a much greater amount of benzyl chloride or leucotrope. This reduction leads to yellow compounds very unstable when exposed to the air but which can still be removed by washing in order to obtain a fairly good white.

To the last group belong the Indanthrene dyes:



Indanthrene Blue S (N-dihydro-anthraquinone-azine), Indanthrene Blue GBC (di-chlor-Indanthrene), Indanthrene Blue GC (di- and tri-brom-Indanthrene), Indanthrene Blue RC (mono-brom-Indanthrene), Indanthrene Bordeaux B (di-anthraquinonyl-di-amino-anthraquinone), Algol Blue CF (di-brom-Indanthrene), Algol Blue 3G (di-oxy-Indanthrene), Algol Red B (anthraquinone-anthra N-methyl-pyridonamine), etc. None of these dyes can be reduced by Bude's reduction mixture. The addition of phenol, acetine, aniline is of no use. Their leuco derivatives have a very great affinity for the fiber and cannot be discharged white by means of Rongalite CL. They are, therefore, used as hydrosulphite color discharges for the dyes of groups 1, 2 and 3.

The B. A. S. F. took quite a few patents in connection with the discharge of Indanthrenes by means of Rongalite CL, but none of them is of any practical or proper application and they were only a mere advertising for the use of leucotrope in discharge printing pastes. (D. R. P. 231,534, 235,879, 235,880, 240,513, 246,252, 246,519, 247,099, 247,101, 247,102, 250,084; F. Z. 1912, 309; F. Z. 1913, 45). To this group also we would range the Algol, Cibanone and Hydron colors.

Hydron Blue G and R, however, can be classed as intermediary, since they are between Indigoids and anthraquinone vat dyes. Their reduction gives lemon yellow products which turn green rapidly if exposed to the air. We can admit that there is scarcely any or no benzylation, as in the case of indigoids (F. Z. 1913, 14, 56, 212, 309).

Cassella, however, took a patent for a discharge process of Hydron Blue by preparing the cloth with an alkali (NaOH, Na_2CO_3, or silicate) and printing a white discharge composed of:

460	parts thickening
150	parts Rongalite CL
50	parts Rongalite C
50	parts Leucotrope W
100	parts zinc oxide
70	parts chalk
80	parts soda ash
40	parts glycerine
1,000	

After aging, pass in silicate, rinse and dry. The white thus obtained is not pure. The printing paste is very sticky and renders the printing very difficult.

Quite lately the British Alizarine Company obtained a patent which seemed to solve the problem (British Patent No. 209,188). The discharge paste is composed as follows:

No. 1	No. 2	
40	40	parts starch
32	30	parts glycerol
240	240	parts water
220	270	parts Leucotrope W
60	..	parts soda ash
..	75	parts sodium acetate
140	175	parts Rongalite C
100	..	parts zinc oxide
..	10	parts zinc acetate
40	..	parts chalk
80	120	parts calcium acetate
48	..	parts alcohol
1,000	960	

The cloth is dyed and then impregnated with calcium acetate; the discharge is produced by either one of the above pastes. Finally, the cloth is aged at high temperature (130 deg. Cent.) for twenty minutes, and dried in the usual way.

We were unable to obtain pure whites even by using contents of leucotrope up to 27 per cent with 17.5 per cent rongalite. The use of calcium acetate is considered to be novel in discharging processes, and the patent applies to similar water-soluble salts, such as zinc acetate, calcium chloride, barium chloride or other salts capable of forming with the leuco-dyestuffs salts stable in the air.

Results of using oxidation discharge agents so far have not been more successful. Again we observe that the dyes of the Indigo series are the most successful and can easily be destroyed by certain oxidizing agents. The other vats, particularly Indanthrenes, resist such action.

The white effect on Indanthrene dyed grounds has only been realized successfully by means of reserve processes. Besides having a mechanical action in forming precipitates on the fiber, certain compounds determine the destruction of the hydrosulphite of the dye bath and thus avoid, by the formation of insoluble or slightly soluble salts of the leucos, the fixation of the dye on the resisted places.

The foregoing has to be completed by a few words on sulphur color discharges which have been ranged, on account of their constitution and properties, in a special place.

The sulphur dyes are, as you know, unfortunately destroyed by chlorinating processes, but resist particularly well the effect of light and soaping, are fast to crocking, do not attack the fiber in the slightest, and are manufactured to-day at exceptionally low prices.

Dyestuffs possessing such properties could not escape the attention of the textile chemists to be applied for discharge effects; but extended research work in order to produce white or colored discharges on sulphur-dyed grounds has never been crowned with any particular success. Back in 1905, over ten years after the appearance of the first sulphur dye on the market, the first solution

of the problem seemed to have been found, giving fairly good results; the chlorate discharges could be applied in some particular cases. Indeed, certain sulphur dyes can easily be destroyed by oxidation, but the resulting white, particularly on medium and heavy shades, shows an appreciable lack in purity. Color discharges, with the exception of certain pigment discharges such as those used for Indigo, are not possible and the fiber is fatally injured. I know, though, of quite a great number of Sulphur Black chlorate discharges being carried out in this country, and very successfully indeed; but I know of all the trouble the mill chemists have had to carry it through, and of their great ability for having done so. In fact, a process which demands too great care onthe part of the printer, and which can at any moment injure the fiber (tendering), never has acquired the favor of the textile chemists.

Considerable work has been carried out on the discharge of sulphur colors by reduction. The sulphur dyes under the action of rongalite, for instance, are very easily converted into their leuco derivatives, but these leucos have such a great affinity for the fiber that they can only be removed with great difficulty by simple washing methods and when dyed in light shades. In a German patent (D. R. P. 246,519) the B. A. S. F. points out discharge process on sulphur dyes which consists of padding the fabrics in an aqueous solution of hte sodium salt of the di-methyl-benzyl-phenyl-ammonium-di-sulphonic acid 150/1,000 (as you know, Leucotrope W is the calcium salt of the mono-sulphonic acid), and to print a Rongalite CL discharge.

70	parts zinc oxide
70	parts glycerine
40	parts anthraquinone
100	parts Rongalite CL
115	parts sodium di-methyl-benzyl-phenyl-ammonium-di-sulphonate
150	parts water
455	parts alkaline thickener
1,000	

The material is aged five minutes and passed through boiling sodium silicate solution 1 per cent.

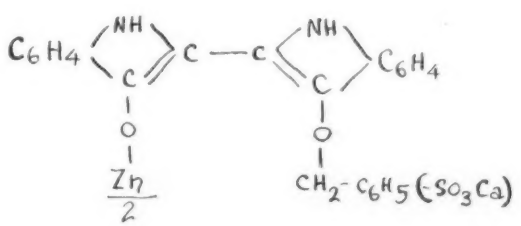
This patent, however, seems only to secure the guarantee of priority of this process to the B. A. S. F. On a practical scale it has been impossible to apply it for most of the sulphur dyes. Here also pure white and color discharge effects have only been obtained by the way of resist methods.

It seems, then, that the discharge operations lack, up to the present, two very important processes: full reduction discharge effects to be obtained on absolutely fast dyes, Indanthrenes and the dyes which are included for their chemical nature in this group, and, second, full reduction discharge effects on material dyed with the cheaper sulphur colors.

The reason for this situation is undoubtedly due to the chemical nature of these products and more to the chemical nature of their leuco-derivatives. It is not possible to set up a general discharge rule classing these compounds according to their dyeing properties, as never would a rule show so many exceptions; but there are still a few conclusions to be drawn from important facts which can be resumed as follows:

The affinity of the leuco-derivatives for the fiber increases in each series from the simplest dye to the most complex. Indigo white, for instance, has practically no affinity whatever for the fiber, while the leuco-indigoids and certain leuco-derivatives of the anthraquinone vats show an affinity many times greater than the one of the best direct color. There is also a certain anti-parallelism between their affinity and the solubility. The introduction of substitution groups (halogens, methyl, ethyl, methoxylic and ethoxylic groups, etc.) increases the affinity by a proportionate increasing insolubility: Indigo to be compared with halogen Indigoes; Indanthrene with brominated and chlorinated Indanthrenes, etc. But in the meantime these properties are accompanies by a decreasing reactivity of the leucos or any body capable to react on the enolic hydroxyl (formation of salts, alkaline earth metals or heavy metals, esterification or etherification). This is brought into evidence by the reaction of benzylchloride; or, better, the leucotrope.

The action of leucotrope up to date is considered as one of the most energetic methods of benzylation which can be carried on by means of printing pastes. Reinking (F. Z. 1910, 243) believes that the reduction of Indigo with hydrosulphite in the presence of zinc oxide and Leucotrope O or W gives the zinc salt of benzylated leuco indigo:



The presence of zinc oxide, however, is not necessary, the benzylation being carried on in any slightly alkaline medium. The reduction with simultaneous benzylation with either free benzylchloride or the leucotropes, according to the facts exposed above, is practically only possible in the case of dyes of the Indigo series, only they give compounds resisting the oxidizing action of the air and

which can be removed by washing with alkaline solution (if they contain sulphonic groups i. e.) in order to obtain white effects; but in this case we shall have a perfect discharge process by reduction.

The less reacting leucos of the dyes of the Hydron, sulphur and vat colors, however, will give only half discharge or no discharge at all. Their molecules are too lazy to enter any full reaction with compounds such as dimethyl-phenyl-benzyl-ammonium-chloride, and to form non-hydrolizable products, if there is any reaction; and the problem is to find more active compounds than ammonium bases, which are far more distant in the scale of basicity, so as to force this pseudo-inactivity of the leuco bases and to produce their stabilization.

Chairman Grandage—Mr. Kern has expressed a willingness to answer questions, if you care to ask them. Are there no questions whatever? If not, Charles A. Seibert, of the General Dyestuff Corporation, has consented to present for us the next phase of our problem, "Vat Dyes for Wool."

Mr. Seibert! (Applause.)

Vat Dyes for Wool

By Charles A. Seibert
General Dyestuff Corporation

Mr. Chairman and Gentlemen: In the first place, of course, you all appreciate the fact that the endeavor to introduce vat colors for application to wool has, up to the present time, met with very little success in the United States. The reasons are probably many and varied, but I am inclined to believe that the most important among them is the fact that there is a lack of information as to the ease of application

When you mention vat colors to the average dyer, he immediately associates the idea of alkali with it. Alkali, we all know, is detrimental to wool; in fact, to all animal fibers. However, to-day, as a result of exhaustive experiments, our friends abroad have placed at our disposal almost a complete line of vat colors which are practically soluble in water without the addition of any caustic soda or any other strong alkali.

Of course, the dye bath, in order to secure the best results, is used slightly alkaline, with ammonia; but the alkalinity is so small that you get just the faintest trace of an alkaline reaction with phenolphthalein paper, which, as you probably are all aware. is one of the most sensitive indicators for alkalines.

To-day we have thirteen colors comprising that group, all of which, with the exception of two, are furnished in grains or solid form. Of course, both the pastes and the grains, or solid form, are more or less, in comparison with the usual dyestuff, unstable. That is, you cannot put them in a keg, knock the head in on the keg, and let them stand around, because decomposition takes place. However, if ordinary precautions are taken to keep them airtight they will remain usable as long as we have so far had any experience.

Next we will proceed to the dyeing. I have samples of those colors here in grain form which we will be pleased to show to you; that is, to anyone interested. I will just set these down here in case anyone cares to examine them.

As to the method of application, which, I believe you will agree with me, after you have heard it, is about as simple as could be: The dyeing is carried out in an open tub, or it can be carried out in an open tub or in a machine, a circulating type of machine preferably, similar to the vacuum or Franklin, or in most any other type of machine in which the liquor circulates. The usual proportion of dye liquor is used.

The dye bath is prepared by merely making a small addition of ammonium, glue and hydrosulphite. In other words, to about 1,000 liters (which is, roughly speaking, about 225 gallons) you require 500 grams of glue, 500 grams of ammonia and probably double that quantity of hydrosulphite. In 225 gallons, I think you will all agree with me that that isn't a large amount of alkali.

As I say, the bath is prepared with that quantity, and the dyestuff which has just been stirred up with probably one-third the quantity of water necessary for the entire dye bath, at a temperature of about 160, is added through a sieve, or other ordinary strainer, to the dye bath. This will reduce almost immediately; that is, with a slight amount of agitation.

The dyeing is carried on best at a temperature of about 120 deg. Fahr. Of course, that can vary within 5 or 10 degrees either way, but I have obtained the best results at a temperature of about 120 deg. Fahr.

Sometimes it may be necessary to add a small amount of ammonia during the dyeing process. What I have ascertained from my experiments so far is that as the dyeing proceeded I occasionally tested it with phenolphthalein paper, and if I did not get a very slightly alkaline reaction I added a small quantity of ammonia but at the same time an equal or double quantity of hydrosuphite.

Our experience from the practical viewpoint has been very limited. We are practically confined to what we have learned in the laboratory. Therefore, it might be necessary in practical working—it would probably—according to the conditions which we meet in the various mills, to vary the formula somewhat. However, so far, in the experiments made with the amount of ammonium and hydrosulphite I have mentioned to start with, we have not found it necessary to add any great amount, and where I found it necessary to add any I believe it was because of the fact that something had gone wrong somewhere and I hadn't been quite accurate enough with my measurements.

There are two methods which we have found can be used, especially for the dyeing of heavy shades. In light shades an immersion of from forty-five minutes to one hour has been found sufficient to exhaust about 80 per cent of the original amount of color. However, when we endeavored to secure full shade dyeings we weren't always so successful, and we had to resort to two methods.

One is this: We immerse the material for perhaps twenty minutes to half an hour, squeeze or wring it lightly, permit it to oxidize for perhaps an equal length of time, and again immerse it for another half hour. That is done, of course, in order to get full shades.

Another method—one that has given better results but which perhaps the practical dyer might object to because it requires a little more skill—has been to immerse the material for perhaps a half hour and then gradually add, in small quantities, ammonium acetate, in order to reduce the small amount of alkalinity present and bring the bath to neutral or, in fact, slightly on the acid side. That, of course, causes the dyestuff to precipitate, but the precipitation must be in such fine form that very little of the color can be removed by continuous washing, either hot or cold.

In connection with that method, it occurs to me that someone will say: "Well, suppose you wanted to keep a standing bath. If you can't keep a standing bath without a loss of 20 per cent of dyestuff it won't be practical."

Well, that is true. But a further addition of ammonium and hydrosulphite will again cause any dyestuff which has remained in that bath to reduce and be ready to be taken up by the fiber.

I mentioned that these colors can also be applied in a standing bath, and the exhaustive qualifications of practically all the members of the group are about the same. In other words, all of them exhaust practically about 80 per cent of the amount of the dyestuff entered into the starting bath, and it is therefore necessary to make that allowance.

With regard to the additions in combination dyeings, so far as we have been able to determine in the laboratory, it holds good. In other words, in making a combination of two or three colors—and endeavoring to keep a standing bath—the second and third runs hold pretty true to shade.

As regards the fastness properties of this new line of vats, they also vary very slightly in the different members of the group. On the whole, however, the entire group has excellent fastness to the usual requirements, such as light, fulling, potting, milling, alkali, acids, perspiration, carbonizing, stoving, wet and dry finishing, and rubbing. Rubbing, of course, depends a good deal upon how much you wash and clean your dyeing before you dry it.

I have here two-strength dyeings which have been made on 100 grams of raw wool, illustrating each of the thirteen colors. I am going to pass them around, because later on I would like to have you compare the feel and the condition of the wool that has been dyed with these vat colors with that which has been dyed with the after-chrome colors by the usual after-chrome method. Incidentally, I would ask you to note the penetration and level dyeing, also the brightness of some of these shades, especially the red. I might remark that in the group there are one yellow, three browns, two reds, violet, blue, three blacks, a green shade, jet shade and red shade.

We have made some comparative light tests with some of the so-called fastest to light colors, both after-chromed and on a chrome mordant, colors as used to-day, compared with this group of vat colors. I cannot show you the complete range, due to the fact that for some of the colors I did not have time to dye samples. I understood that this meeting was to take place next Friday evening, and it wasn't until last Monday morning that I was advised it was to take place this evening. As a result, the material which I have been able to gather is somewhat limited.

However, the Alizarine Blue Black types are the colors which are mostly used to-day for grays, because of their good all-around fastness properties. I have here some light tests made in the Fade-ometer of the Alizarine Blue Blacks, both on a chrome mordant and after-chromed. The shades are somewhat heavier than the shade of the wool vat gray; the Alizarine Blue Blacks were exposed for thirty-seven hours, the Vat Gray and other vat colors for forty-six. That was as long as I could keep them in until the last minute to-night, and from them you will see that the Alizarine Blue Black dyeings are very much more faded than the Vat Gray or the other vat colors, with the exception of the yellow. The yellow is changed considerably. However, it is changed very much brighter. At the same time, we have some of the fastest of the yellows after-chromed, also the reds, the Alizarine Red W, Alizarine Red PS, the greens, the Alizarine Cyanine Greens, and blue; I think we have the Alizarine Blue SKY, Anthracene Yellows, and so forth. And I think you will agree with me that these new vat colors compare very favorably, if they are not superior.

I have only brought along the after-chromes because the after-chrome colors as a group are considerably faster to light than the chrome mordants. I have them right here and will pass them around for you to examine. I would thank you, though, gentlemen, to see that they eventually come back to this end of the house, because if you do it will save me a lot of work. I trust I am not trying your patience by handing out these things, but I think that is the only way to convince anyone, to show them. I know that is the way you would have to convince me.

Incidentally, these dyeings of the vat colors which I have handed around have been dyed with very little han-

dling. I was very anxious to be convinced myself that the penetration and level dyeing properties were good, and if you will remove those dyeings from the envelopes and compare them with the smaller envelopes, which contain the after-chromed dyeings, you will find that, with the exception of the browns, all the vat colors show more level. Especially is that noticeable on the gray. That is, the Alizarine Blue Black shows very much more unlevel than the majority of the vat colors.

I do not know if there are any wool dyers present this evening. However, not being a wool expert myself, I have shown the results of these dyeings to some dyers who have made a specialty of dyeing raw stock wool, and they agreed that the results were very good.

The next question that arises is with regard to the cost of dyeing with these new colors as compared with the cost of dyeing with the regular after-chromed colors, or chrome mordants. Necessarily, it is somewhat higher, if you consider the cost of the dyestuffs and the chemicals used only. However, you do not require steam, or very little; the time is, if anything, shorter than that required by the usual method of dyeing.

The final and chief point of interest is that you can dye shoddy material with these new vat colors and turn out a finished piece of cloth with a grade of shoddy which you could not find any use for at all if it were necessary to dye it by the usual after-chrome or chrome-mordant method.

Of course, that is something which I can't demonstrate to you here, but I think you will appreciate that fact: that after wool cloth has gone through the mill and been carded once or twice, or possibly thrice, it gets to a point where it will no longer stand the required boiling with chrome in order to fully develop the shade. When it gets to that point there is only one thing left to be done with it, and that is to put it into the cheapest kind of union mixtures.

As I mentioned before, we have had very little practical experience in the United States, and as a result we haven't any practical trials that have been made here, or the results of such trials, to show you. I am informed, however, that recently one of the demonstrators for one of the concerns handling these dyestuffs dyed in a circulating machine batches of rabbit hair, varying from 60 to 80 pounds, which turned out very satisfactorily.

Incidentally, other experiments have been made on a small scale to dye raw stock, which have not turned out so satisfactorily. I thought it advisable to mention that because perhaps some of you had heard of them. But I hope at the same time you have heard of the satisfactory results.

To get down to the last of it: Of course, while these colors can be used, if necessary, even on piece goods, we don't suppose that we would have much success in trying to introduce them to start with, and they are mainly recommended at this time for the dyeing of shoddies, rabbit hair, etc., for which they have been extensively used since probably 1914, or 1915, in Europe. In 1914, or thereabouts, vat colors were used in Europe for loose wool dyeing, for military uniforms, and at that time they had only the regular vat dyestuffs as they were used for cotton at their disposal, but still in all they were used by selecting those which required the smallest amount of alkali and reducing that amount of alkali in the dye bath to a minimum. However, these new wool vat dyestuffs as they come to us to-day are a vast improvement over what they had at that time, and if they could use the regular types at that time it appears reasonable to assume that these new types can be used to much better advantage.

I happen to know that they were used in 1914, 1915 and 1916, because I was at the Bayer Company's laboratory, Leverkusen, Germany, during that period, and to illustrate some of the work from practical trials abroad I have here some cards which I will be pleased to pass around, showing dyeings on rabbit hair and melanges. By the way, these dyeings on rabbit hair were made here in the United States by Dr. Schwartz, of Kuttroff, Pickhardt & Co., to whom I am indebted for the use of this card as well as some of the other literature.

At the same time, these wool vat colors have found some use abroad for the dyeing of carpet yarns. Here is a card showing such dyeings, which I will also pass around.

I assume there may be some fine points in connection with this thing that I have skipped over. If I have, I guess you have been bored that much the less. However, I think I have said enough. I have these fulling tests, if anyone cares to look at them. I will wind up this discussion, with your kind permission, but will be pleased, if I can, to answer any questions which anyone may care to ask.

Discussion of Vat Dyes for Wool

C. F. Schaumann—When they reduce, do they reduce to a similar color?

Mr. Seibert—Yes. Take the majority of them—such as the violet, blue, gray, black and red—they reduce yellow or shades of yellow, the same as the usual indigoid derivatives. The yellow reduces yellow; the browns reduce more on the reddish cast.

Mr. Schaumann—In dyeing shoddy containing cotton, do they color the cotton?

Mr. Seibert—Yes; not quite as deep as the wool, but to a considerable extent; and that can be illustrated somewhat. You will find at the end of some of these hanks a little string, which is cotton.

Dr. Peter Fiebiger—As a starter for introducing this

new dyestuff to the wool dyer, it seems you think that it is especially useful for light and medium shades, as the special fastness is then obtained without excessive cost?

Mr. Seibert—Yes, to the first part of your question, Doctor, and, no, to the last part. Perhaps I can answer your question better by saying that it requires about a 4 or 5 per cent dyeing of the paste type to equal a 2 per cent dyeing of the usual powdered type of after-chromed or mordant colors. In other words, taking that as a basis for a 5 per cent dyeing of a paste color, I would figure that the cost per pound of dyeing shoddy for color and chemicals alone would be from 12 to 15 cents, varying, of course, with the color used, because the prices vary.

C. C. Adams—Have these dyes ever been used for printing?

Mr. Seibert—Unfortunately, I cannot answer that question. Perhaps Dr. Hager, who is sitting at your left, can answer that better.

Dr. Hager—Not that I know of.

Mr. Seibert—Of course, in order to keep down the costs you must confine yourself to medium shades. However, if you will compare some of the shades as shown here, for instance, the heavier dyeing in each instance that has been passed around is an 8 per cent dyeing of paste. The paste as compared with the powdered colors, for comparative strength, is as 5 and 6 to 1, and the heavier dyeings represent an 8 per cent dyeing of paste, with the exception of the blacks, one of which is 9 per cent and the other two 10 per cent.

In making those dyeings which I have brought with me to-night as exhibits I did not trouble to exhaust the bath, but, rather, was anxious to show the level dyeing and penetrating properties. We could probably get the equivalent of these 8 per cent dyeings with 6 per cent if we exhausted the bath to its utmost possibilities.

Dr. E. S. Chapin—What were those fulling tests?

Mr. Seibert—Those fulling tests were made for three hours with1 10 grams of soap and 3 grams of soda; that is, the usual commercial quality of soda ash, per liter, at a temperature of 150 deg. Fahr.

They don't appear to be very well fulled, and the reason for that is this: We haven't a fulling mill, and I had so many of them to make that I merely took glass Mason jars, took off a piece of the dyed material, a piece of silk noil, a piece of raw cotton and a piece of loose wool, and in order to get some friction I added a dozen to eighteen of wooden blocks, round wooden blocks, of about the same size and weight as an ordinary checker.

In looking over some of those fulling tests you will notice that the white has become pretty well mixed with the color. Incidentally, under the night light those things appear more stained than they actually are. In fact, when I looked at them to-day they looked very well to me. After I had them dried, which was the last thing to-night, I wasn't so well pleased with them. However, if you will examine them in daylight you will find that the staining is very slight and is confined mostly to the silk noils. The wool and the cotton have been left pretty clear.

D. P. Knowland—Mr. Seibert, when you made these dyes on loose wools were they made on scoured or unscoured material?

Mr. Seibert—Unscoured. . . . That isn't entirely correct. I have out there somewhere or other a sample that is just a partly scoured stock.

Mr. Knowland—Don't you think your results might have been better if you had used wool in the grease, as dirty as it might come?

Mr. Seibert—That is possible.

Mr. Knowland—Have you ever tried it?

Mr. Seibert—No, I haven't.

Mr. Knowland—Have you ever tried yarn dyeing?

Mr. Seibert—I haven't made any fulling tests, or anything of that sort, with the yarn dyeing.

Mr. Knowland—I am speaking about the grease.

Mr. Seibert—No, I haven't made any dyeings in the grease.

Mr. Schaumann—It might rub more.

Mr. Knowland—It would rub less.

Mr. Seibert—As I said, the time at our disposal to get this material ready was very limited.

There is one factor in the application which I failed to mention, and that is the finishing. After the dyeing has proceeded the usual length of time, or an hour, it is only necessary to roughly squeeze the material, permit it to oxidize for a very short time, or pass it immediately through an oxidizing bath, preferably of perborate or peroxide (2 per cent is enough), wash in cold water, acidulate with acetic acid preferably, and wash. In other words, these fulling tests have been made from the dyeings which have been finished in that way. They were merely washed in cold water.

I feel confident that if the dyeings had been washed more thoroughly, or as thoroughly as we could wash them, in hot water, perhaps containing a slight amount of ammonium—that is, as hot as anyone would use it who knows anything about handling wool, 130 or thereabouts—the results might have shown better. However, the bleeding was very slight. The fulling liquor was just about tinted, in all instances, even including the blacks, and there are very few chrome colors that I know of, fulled under the same conditions, which would not at least tint the liquor as much.

Chairman Grandage—Are there any more questions?

Dr. E. S. Chapin—Do you think this process is suitable for Government olive drabs?

Mr. Seibert—Yes.

Dr. Chapin—Have any acetic acid tests been made?

Mr. Seibert—No; but from what I know from former

dyeing experience, dyeing regular vat colors for Government shades, both khaki and olive drab. I haven't the least doubt but what these will hold up well; although, as I frankly say, we haven't made the tests; we haven't had the time. Perhaps at some future time, when we get this thing all in line, we may have the privilege of coming down and addressing you again and giving you the full story.

Dr. Chapin—When I was at Hoechst I heard they had a vat olive drab which they were going to bring out. I haven't heard anything further about that, have you?

Mr. Seibert—No. However, among the group that I passed out there is a khaki, and that khaki, in combination with any of the browns, and perhaps a shading of yellow, would make the olive drab unquestionably.

Mr. Galloway—Have you tried those colors on silk?

Mr. Seibert—No; but from my experience with silk I have the greatest confidence they are going to be used on silk. It seems to me that they have an affinity for silk, although I haven't tried it yet.

Mr. Galloway—Do these things have any better affinity for wool printing than the ordinary wool printing color?

Mr. Seibert—Unfortunately, that is a question I cannot answer.

Discussion on Vat Dyes for Silk

Chairman Grandage—Gentlemen, I presume you have covered the subject of wool to your own satisfaction. The fourth phase of our subject to-night we had hoped we would be able to present to you through one speaker who would cover the entire subject. Unfortunately, for several reasons we cannot do what the announcement told you we were going to do: announce the speaker. Our January meeting, which is to be held in Paterson, is to be an all-silk meeting. That is one reason: we wanted to save some of the information for that meeting. Another reason is that the speaker we had expected to have address us didn't have sufficient time to prepare the data and the information for to-night. We have with us, however, two or three men who are outstanding in the silk industry, I am quite sure, one of them in particular whom I am mighty glad to see here to-night. We don't see him very often. He is one of our distinguished members, an "all-American" member of the Council—Dr. Scott. I wish Dr. Scott would say just a few words to us, if he will. (Applause.)

Dr. Walter M. Scott—I would be very glad to say a few words, but I didn't come down here with the intention of taking up your time with a paper of my own. In fact, I didn't have anything prepared on the subject.

There is only one thing I would like to touch upon and that is an interesting fact that I noted in connection with Mr. Kern's talk, when he spoke of the various classes of vat dyestuffs with respect to their dischargeability, that is, the ease or the difficulty with which they discharge. It seems to me that, quite curiously enough, those classes line up very similarly to the ease or the difficulty with which those dyestuffs can be applied to silk.

Take the first class, the brominated Indigoes—they have a very, very good affinity for silk and the quite easy of application. And as you go on down through the groups that he mentioned, through the thioindigoid groups and down to the Indanthrene series, you begin to get more and more difficulty in applying to the silk fiber, and you have to use a number of subterfuges in order to get them on. Even then, you don't get very good results. There probably is some underlying chemical reason for those comparative differences, but I don't know at the present time just what it is.

I haven't anything special to say, and I think perhaps some of the other silk men may have something more to say on this subject than I have.

Thank you very much gentlemen. (Applause.)

Chairman Grandage—We have another member, who is outstanding in the silk industry, who always smiles when he comes in to every meeting that we have during this particular year—smiles at me especially. Will Mr. Lotte be willing to say just a few words to us? Mr. Lotte! (Applause.)

E. F. L. Lotte—I had hoped you would leave the silk men alone to-night. I hadn't intended to say anything, particularly as it is getting rather late. However, I was just thinking about the silk men, in connection with vats, and I thought they were a little bit like Thad Stevens. I don't often tell a joke but this particular one seems quite apropos.

Thad Stevens met a friend one day and he said, "Thad, I had a dream about you last night."

He said, "You did? What did you dream?"

"Well," he said, "I dreamt I was down in hell. We heard a big noise at the door suddenly and the devil said, 'Who comes there?' A voice replied, 'This is Thad Stevens.' The devil said, 'Give him a box of matches and sulphur and let him go and make a little hell of his own.'" (Laughter.)

I was almost wishing you would let the silk dyers have a little hell of their own, all to themselves, on these vat colors.

I don't know that I can say a great deal on this subject because I haven't followed up the practical end of vats. The trade has the idea that if we have vats they will stand everything, and the first thing we know they will say we haven't given them vats because they rub. Another thing: they will put them up to light and say, "Here is pink. We have some other colors that stand light better than that does."

One of the difficulties we have had in silk has been in getting the vats so that they will be even in color. I am glad to hear some say that in other fibers they are able to get that. Of course, you all know that we have used vats in striped shirtings, and so on, in silk, and they have gone as far probably as 75 per cent of silk, but they were always broken up in stripes, so that the unevenness didn't show. (Laughter.)

As you know—and as the speaker who touched on the subject of wool mentioned—one of the hardest things that we had to contend with at first, and one of the things that made the silk dyers tremble was alkali. But they have overcome that, so that they are using the vats on silk. However, we still have the trouble of not being able to get vat dyed silks which enable us to guarantee an even shade so that they can be used in a plain fabric.

As to piece dyes, we have never made many experiments as far as vats are concerned. I believe that Dr. Scott's firm have made more experiments along that line than any one else.

If you can help us get vats even, I think it will be a big step toward our using more vats, and it will be a great help, because vat colors are coming in more and more.

Our other trouble—and one of our big troubles is in the light shades—is in having them stand light as they should, because we have quite a few that don't.

Those are the problems that I feel the silk men have to work out, and if they have them all worked out by the time we come to Paterson in January, that will be the biggest meeting and the most beneficial meeting that will have been held for the silk industry. (Applause.)

Chairman Grandage—In fairness to those members who are here to-night who are members of the dyestuff profession (those who sell and make dyestuffs), we should not introduce the subject of vat dyes on silk without at least giving them an opportunity to answer some of the troubles that Mr. Lotte has said they do have in the silk industry. We never have any of those in the cotton industry at all; we don't have any trouble with vats whatsoever. (Laughter.)

Are there any dyestuff men here to-night who want to answer to that?

Mr. Seibert—May I ask a question? Hasn't the introduction of mechanical machinery for the handling of the silk skeins overcome a good deal of that difficulty, Mr. Lotte?

Mr. Lotte—To some extent, but not entirely. Of course, there are a good many colors that could not be used; that is, we haven't overcome as yet the difficulty with a plain fabric all vat. No matter how much care we take, it is still streaky, except in very rare cases, and those are the ones that are not fastest.

Chairman Grandage—Is there someone else who would care to contribute to the silk industry? Mr. Dengler, would you care to say a few words to us on vat colors as applied to silk, or tell us some of your troubles?

Dr. Carol E. Dengler—Mr. Lotte mentioned all the troubles he has, so I think there is nothing further to be said. As far as the application of the vats on piece silk is concerned, so far as I know, it has not been successful. It could be used on silk fabrics to only a certain extent, but with the market nowadays full of crepes and crepe de Chines, any padding machine or circulating machine or jigs will not do.

We did a few dyeings of pieces of taffeta but the penetration and their appearance are not as satisfactory as with the other method of dyeing. Still, I believe that in the near future we will be able to apply vat colors to silk very successfully.

In silk, the important question is that of tension. A padding machine cannot be used. A circulating machine cannot be used. The only thing that can be used is a continuous dyeing machine, a slow dyeing machine, where the goods are carried without any tension whatsoever, and only under water.

To exactly what extent this has been worked out I cannot say. I hope at the next meeting, in Paterson, we will talk more about this subject. (Applause.)

Chairman Grandage—Mr. Kern and Mr. Seibert, I am sure we are very deeply indebted to you for the very able data you have both given us on the subject of vat dyes. I will be very glad to entertain a motion for a vote of thanks to the two speakers and to those others who have contributed to the silk phase of this subject.

Dr. Killheffer—I so move.

. . . The motion was regularly seconded and unanimously carried by a rising vote. . . . (Applause.)

. . . The meeting adjourned at 10.15 p. m.

Sodium Silicate as a Corrosion Preventive*

By R. P. Russell

Assistant Director, Research Laboratory of Applied Chemistry, Massachusetts Institute of Technology, Cambridge, Mass.

This paper is to deal with the use of sodium silicate (water glass) as a means of decreasing corrosion in water heaters and pipe lines. The silicate is applied in either solid or liquid form, enough being added to the water to cause the formation of a film on the metal surfaces. This film is self-healing, and by its protective nature causes the elimination of red water and markedly decreases the

*From a talk delivered at a meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists, November 18, 1925.

corrosion. The process is inexpensive, requires but little attention and in a number of full-scale installations has given very satisfactory results.

The Importance of Corrosion

Losses due to corrosion, in terms of direct replacement of metal alone, have been estimated at from $500,000,000 to $3,000,000,000 a year. Even this tremendous loss does not include the extra expense of labor involved in replacement, losses due to shutdowns, or the great harm to manufactured material which may ersult from contamination by the products of corrosion. This latter effect, decreased quality of the product, may be, and often is, as serious as the actual metal losses involved.

Principles of Corrosion

Practically all authorities now agree that corrosion is electrochemical in character, and that the process operates through a corrosion cell. At the anode of this cell metal ions go into solution and at the cathode there is a simultaneous action which may either be the evolution of hydrogen gas, such as is observed when iron is dipped in acid, or an oxidation reaction by dissolved oxygen or other oxidizing agent in the corroding medium. The reactions which take place may be visualized (for the case of iron or steel) as follows:

$$1.\ldots\ldots Fe + 2\ (+) = Fe^{++}$$
$$2.\ldots\ldots 2H^{+} = 2H + 2\ (+)$$
$$2a.\ldots\ldots 2H = H_2 \text{ gas}$$
$$2b.\ldots\ldots 2H + \tfrac{1}{2} O_2 = H_2O$$

From these reactions it can be seen that a number of factors, such as metal composition, condition of the metal surface, hydrogen ion concentration, hydrogen overvoltage, and oxygen concentration may be important. Limiting the discussion to corrosion of iron and steel by ordinary natural waters (since it is in this field that sodium silicate is most effective), the two main factors are known to be oxygen concentration and protective films. It was pointed out as early as 1907 [1] that corrosion of iron under water is practically proportional to the concentration of dissolved oxygen, and in the absence of oxygen that corrosion is negligible. It has been shown more recently [2] that, adjacent to the metal surface, there is a layer of solution saturated with the ferrous hydroxide produced by the corrosion. Depending on the composition of the water and on the addition of retarding agents, the solubility of the $Fe(OH)_2$ may be lowered and a coating of rust, together with substances from the water itself, be thrown back on the metal surface. Such coatings, when properly formed and maintained, interfere with the diffusion of oxygen to the active cathode area and greatly lessen the corrosion.

When iron and steel are attacked by water, the corrosion is relatively uniform if the metal is clean, of reasonable uniformity, and not coated with a discontinuous protective film. If, on the other hand, the metal has mill scale

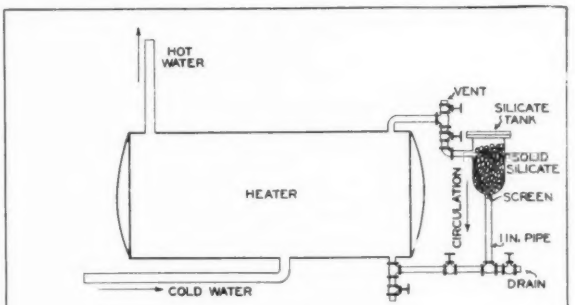


FIG. 1
SIDE ELEVATION
SILICATE INSTALLATION ON HORIZONTAL HEATER

on its surface, has wide variations in composition, or is covered with an imperfect protective coating, certain spots may become and stay anodic, and deep pits result. Pitting often is more serious than the general over-all corrosion, and frequently metal will be perforated by pits before the rest of the piece is appreciably attacked. It is, therefore, highly important that artificial protective films should be continuous.

Methods of Corrosion Prevention

There are three main methods of decreasing corrosion by natural waters: first, by suitable metal composition; second, by removing dissolved oxygen from the water; and, third, by means of artificial protective films. Each of these methods has its particular field of application.

As regards metal composition, it was assumed in the early days of corrosion investigation that the purer the metal the less would be the corrosion in water. It is now known, however, that as far as the ordinary commercial steels and irons are concerned, corrosion by water [3] is practically uninfluenced by the variations in composition encountered, since the controlling factors are oxygen concentration and film formation. Special alloys, of course, are produced to resist corrosion, but their use is at present limited to special applications on account of high first cost.

[1] Walker, Cederholm and Bent, J. Am. Chem. Soc., **29**, 1251 (1907).

[2] Whitman and Russell, J. Soc. Chem. Ind., **43**, 193T (1924).

[3] Richardson, Trans. Am. Inst. Chem.; Hadfield, Engineer, **133**, 414 (1922); Whitman and Russell, loc. lit.

The second method of corrosion prevention, removal of dissolved oxygen, is accomplished either by allowing the water to corrode scrap iron (called deactivation) or by subjecting the water to heat, vacuum and a combination of the two (called deaeration). Each of these processes is successful, but on account of the installation expense should be used only where the water load is relatively uniform or fairly low.

The third method of corrosion prevention (protective films, excluding paints from the discussion) consists in treating the water with some substance which causes the formation of a rust film of such character that further corrosion is greatly reduced. This can be done by the addition of sodium hydroxide or soda ash, and the method is sometimes employed in boiler waters. Large amounts of these alkalies are required to give appreciable corrosion retardation, however, and water so treated can only be used in a limited number of cases.

The chromates and di-chromates also can be used for corrosion prevention, and even in very dilute solutions they have been successfully applied in systems where the water is recirculated and but little make-up is required. Their cost and effect upon the water greatly limit their application.

The film-forming material of widest applicability at present appears to be sodium silicate.

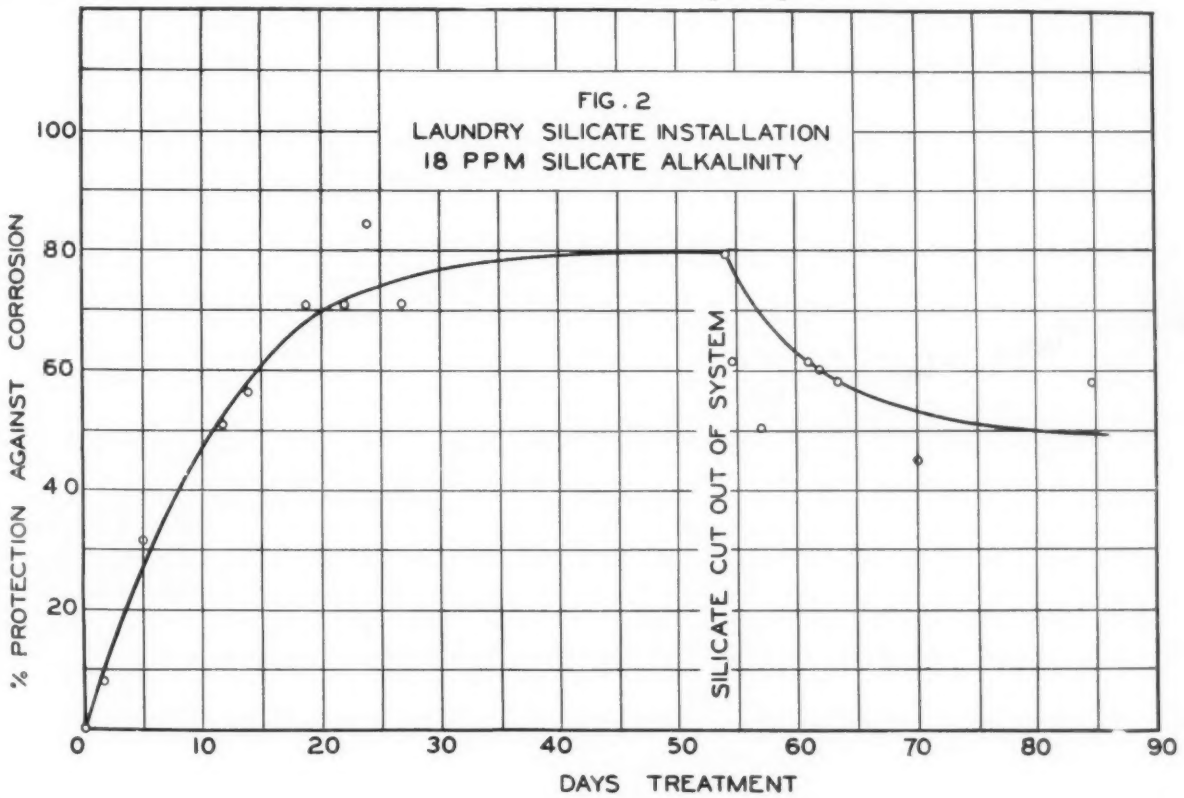
The Use of Sodium Silicate

Sodium silicate, even in concentrations as low as 15 to 20 parts of the silicate per million of water, lowers the solubility of ferrous hydroxide much more than in proportion to the alkalinity, and in these concentrations markedly decreases the corrosion of iron and steel. The mechanism of the process is not completely understood, but may be a combination and co-precipitation of the ferrous hydroxide, the silicate and in some cases the hardness constituents of the water to form a protective film against the metal surface.

The silicate may be applied in liquid (i. e., in water solution) or solid form. In cold water it is necessary to use the liquid silicate, since the solid particles quickly become coated over with calcium and magnesium silicates, which stop the solution of the underlying material. In hot water either solid or liquid may be used, but the many advantages of application in solid form make this method advisable in nearly all cases. The method using liquid silicate will be described briefly first, and the application of the solid will then be discussed more in detail.

Liquid silicate [4] may be added either in doses of rela-

[4] In tests run by the Research Laboratory of Applied Chemistry the best silicate for this use appeared to be one with a ratio of SiO_2 to Na_2O of 1 to 3.25.



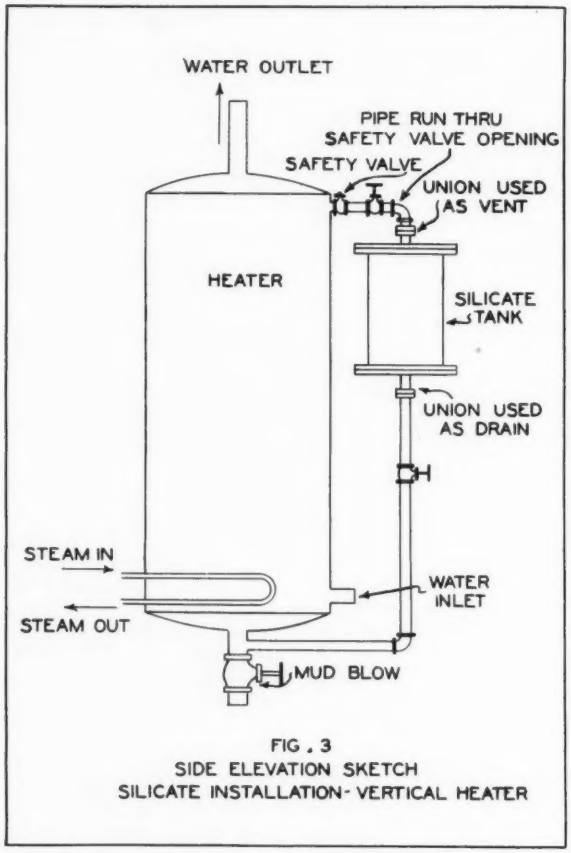


FIG. 3
SIDE ELEVATION SKETCH
SILICATE INSTALLATION - VERTICAL HEATER

tively high concentration (50 to 100 p.p.m.) or practically continuously at considerably lower concentrations (10 to 20 p.p.m.). Even with the latter method, the treatment can be discontinued for several days without a recurrence of "red water" troubles. In other words, the protective film, once formed, is to a certain degree permanent, although periodic "rebuilding" is necessary. In many cases treatment for two or three days a week is satisfactory.

At least one entire municipal water supply[5] is being treated with silicate in this way, and the results have been very satisfactory. An initial concentration of about 20 p.p.m. silicate is required, but as the treatment is continued this amount may be decreased until after a month or two it is only necessary to maintain from 5 to 10 p.p.m. The chief disadvantage of this method of application is the constant attention required.

Application of Silicate in Solid Form

To overcome the difficulties inherent in the above method, F. N. Speller, of the National Tube Company, devised the application of silicate in solid form for hot-water systems. This method has been investigated and developed under the National Tube Company fellowships at the Mellon Institute of Industrial Research and the Research Laboratory of Applied Chemistry at the Massachusetts Institute of Technology. A considerable number of full-scale installations in laundries, office buildings, etc., have demonstrated the success of this method of corrosion retardation. Solid silicate is placed in a small tank attached to the water heater, natural circulation allowing a small quantity to be dissolved by the water. The details of the process are explained in the following descriptions of typical installations.

The application of silicate to a hot water system with a horizontal heater is sketched in Fig. 1. The solid silicate[6] (often contained in a removable perforated metal basket) is placed in the small tank[7] shown at the right of the diagram and natural circulation in the direction of the arrow causes a small quantity of hot water to pass through the silicate tank and into the bottom of the heater. The water dissolves a small quantity of silicate, and in the period at night when no hot water is drawn, the concentration in the heater gradually builds up to about 20 p.p.m. (calculated as NaOH; pH equals approximately 9.2 to 10 depending on the water). This solution is drawn off quickly in the morning and after the first few minutes of operation the water in the heater is substantially free from silicate. However, the first tank-full of even the dilute silicate solution (20 p.p.m.) is sufficient to give protection against red water and corrosion. This installation has given uniformly good results and rusty water (severe before treatment was started) has been eliminated. The percentage protection against corrosion is built up to about 80 per cent in thirty days. This is shown in Fig. 2 in which the protection against corrosion is plotted against the days treatment. It will be seen that as the treatment

[5] J. C. Thresh, The Analyst, **46**, 270 (1921); ibid. **47**, 459 (1922).

[6] A silicate with a ratio of SiO_2 to Na_2O of 1 to 2.25 has been found best for this type of service.

[7] The silicate tank should be approximately 1 per cent of the size of the heater.

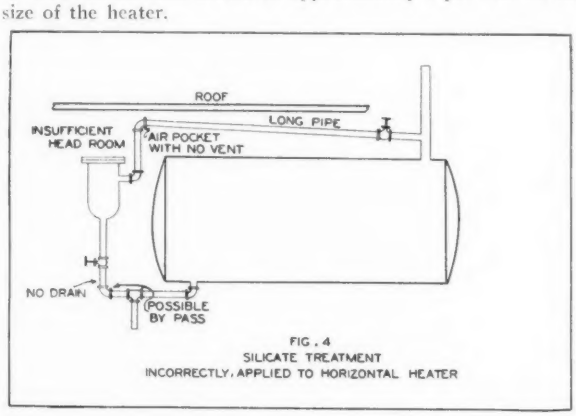


FIG. 4
SILICATE TREATMENT
INCORRECTLY APPLIED TO HORIZONTAL HEATER

progresses the protection gradually builds up to about 80 per cent; i. e., after about thirty days there is only 20 per cent as much corrosion as there was before the treatment was applied. When silicate was cut out of the system for experimental purposes (see Fig. 2) red water started after about two weeks and the operators asked to have the silicate used again.

The solid silicate in the silicate tank becomes inactive after a time and must be renewed before the insertion of fresh material. The time required for renewal, once in four months, and for control, which consists in a simple water analysis[8] about once a month, totals from 10 to 15 hours a year. The cost of silicate in several cases has averaged less than $100 per year for each 10,000 gallons of water used per hour. In this, as in other installations, the rate of circulation is controlled by proper adjustment of the valves on the silicate tank pipe line.

A sketch of an installation in connection with a vertical water heater is shown in Fig. 3. In installing this system difficulties to be guarded against may be illustrated by Fig. 4, as follows:

1. There is no drain for the purpose of removing water in the system when it is necessary to renew the silicate.

2. Cold water from the intake to the heater might bypass up through the silicate tank. This would cause the silicate to become inactive very rapidly.

3. There is no air vent at the top of the system for removing air when fresh silicate is installed. This would probably completely stop circulation and no benefit would be derived from the silicate.

4. The pipe line leading from the top of the heater to the silicate tank is quite long, and the circulating water might be chilled sufficiently to cause the silicate to become inactive.

5. If properly installed, a removable metal basket should be used to contain the silicate, and in this installation insufficient headroom is allowed to make this removal easy.

When properly installed, however, and with but slight attention, solid sodium silicate offers a cheap and effective method of corrosion retardation, particularly where the water load is heavy and subject to wide variations.

[8] To insure that the proper amount of silicate is being picked up by the water, it is advisable to determine the alkalinity either by titration with standard acid or by a colorimetric hydrogen ion concentration method.

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Morris, J. W., Jr., Box 1213, Charlotte, N. C.

Changes of Address

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Alter, Frederick A., 201 Appleton Street, Lowell, Mass.

Blake, Kenneth B., Williams Street, R. F. D., Mansfield, Mass.

Bragdon, Stacy Lloyd, 15 Lincoln St., Gorham, Me.

Browne, Nicholas B., care of General Dyestuff Corporation, 159 High Street, Boston, Mass.

Bume, F. L., 235 Wood Street, Rutherford, N. J.

Clement, D. Scott, The MacGregor, Waltham, Mass.

Hacking, James H., assistant superintendent, Pacific Print Works, Lawrence, Mass.

Kendall, Charles B., c/o Crown Hotel, Providence, R. I.

MacIntyre, James F., care of National, 113 High St., Boston, Mass.

Photis, Christos J., 466 West Twenty-third Street, New York City.

Riley, Fred, 161 Parkview Avenue, Lowell, Mass.
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ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
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Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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MR. FREAR AGAIN

REPRESENTATIVE FREAR of Wisconsin, who has on numerous previous occasions made himself as objectionable as possible to the American dyestuff manufacturing industry, is again seeking the limelight in Congress. This time he proposes an investigation of dyestuff manufacturers as a Trust.

Speaking in support of his investigation resolution he said in part:

> It would inquire into the profits of certain American chemical companies, including the Allied Chemical Company, the Grasselli and Du Pont chemical interests, which under present administration of the law, I am advised, have the American field practically to themselves. Two of these companies, when the last tariff law was enacted, were then shown to have aggregate assets of approximately $1,000,000,000, and therefore were in no sense infant industries. The distinguished Speaker of the House, Mr. Longworth, who now declares the English rubber industry an "international swindle," then led a vigorous fight in the House against importations of any foreign dyes whatsoever and for the enactment of a dye embargo prohibiting the importation of foreign dyes, notwithstanding prior to the war a large share of our reliable fast dyes could only be obtained through foreign imports.

It is no doubt true, as Mr. Frear states, that the particular companies he mentions, and very probably many others who do a general chemical manufacturing business, have made fairly large profits. In the cases which he cites, however, it would be observed that these concerns make a wide variety of products other than dyestuffs. The Du Pont Company derives a large share of its income from the General Motors Corporation, paints, pyrolin and other products entirely foreign to dyes or chemicals. While we have no access to the figures pertaining to the dyestuff departments of the concerns mentioned we doubt exceedingly if any of them would show profits of any considerable size: in fact, our guess would be that the dyestuff side of the respective businesses is conducted at a loss.

A Trust is generally understood to be "a combination in restraint of trade." If there is any "restraint" to the trading in dyestuffs as presently carried on by American dyestuff manufacturers we have yet to learn of it. If Mr. Frear or anyone else can produce any evidence showing that that there has been a combination, or an understanding, or a gentlemen's agreement, or anything else which would tend to maintain prices in the American dyestuff industry, he will be telling the dyestuff manufacturers something which will certainly be a shocking bit of news.

If there is any domestic industry which is more highly competitive than the manufacture and sale of dyestuffs we do not know what it is. This present move on the part of Mr. Frear is, if possible, a little more ludicrous than any of his previous efforts. What possible good he hopes to accomplish or what motive actuates him is beyond our comprehension. However, he at least furnishes some of us with a source of amusement and, thank goodness, not even Congress takes him seriously.

THE COMMERCIAL LEAGUE OF NATIONS

A NUMBER of recent rumors of international trade agreements involve the chemical, dyestuff and rayon industries of virtually all of the large European nations as well as those of America and Japan. But out of this tangle nothing definite has yet appeared. Several of these combinations, proposed obviously for commercial advantages, would be so absurdly conflicting in operation that, all considered together, they might well be regarded as an attempt to apply to industry on a vast scale the old double-cross game of court intrigue so notorious in the annals of history.

While the much-contended Anglo-German dyestuff combine hangs fire, pending readjustment of the financial status of the British Dyestuffs Corporation, we learn that representatives of the German Cartel recently endeavored to secure from England free markets for dyestuffs in the British Isles. Traveling almost on the same cable current is a dispatch regarding a move toward sales agreements among the British, French and Italian dyestuff industries—clearly to counteract before it is too late any sudden assault from Germany in her attempt to regain a larger share of her former world dye monopoly. But our cocksureness at having reached this conclusion receives a slight jolt when we suddenly discover German, Japanese and British dyestuff makers earnestly discussing the mutual advantages of an agreement to shut

American dyes out of the Asiatic markets and control prices and markets to suit their own interests.

Then, in another corner of this world court of commercial intrigue we perceive an interesting though not particularly significant form of "molecular attraction" among the big explosive manufacturers. The Alfred Noble Dynamite Company of Germany and of the United States draws the Koln-Rottweil Company of Berlin and the American Du Pont interests into a sort of put-and-take proposition involving an exchange of patents and processes for the technical benefit of some factors and the financial nourishment of others.

In the domestic rayon industry, meanwhile, there is considerable talk of the advantages in rayon spinners co-operating for technical assistance with chemical concerns making products used in processing rayon. In this country, it has been pointed out by one authority, such combinations of rayon and chemical interests would have as their prime incentive the urgency of resisting foreign competition in the rayon market.

But agreements even in the rayon industry have recently developed an international aspect nearly as startling in its scope as the situation in dyes and explosives. We learn that there are already agreements among the British firm of Courtaulds, the Snia-Viscosa of Italy, several German rayon factories and a leading American group.

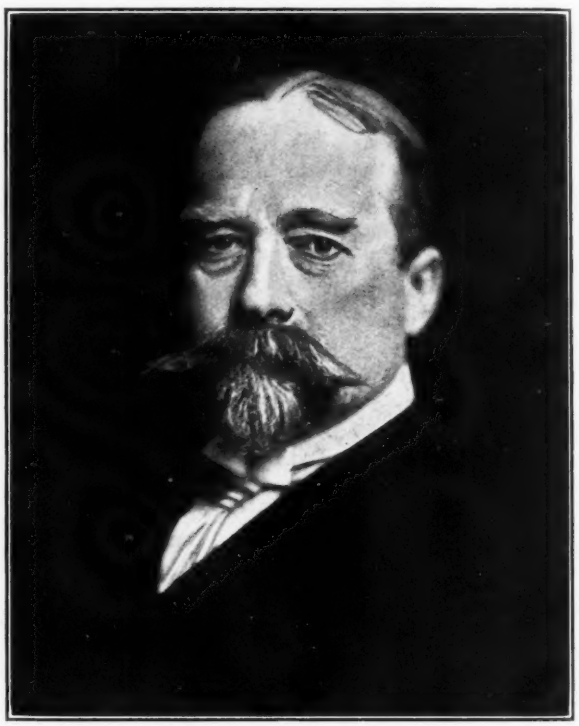
These trade agreements and cartels among industries of competing countries and among the members of an industry in each country are economically *scientific;* that is a truth so universally admitted that it is unnecessary to emphasize it. Such allocations of markets and adjustments of production and prices upon a scientific basis are absolutely essential if competing industries are to exist under our modern industrial system. Can we refrain from asking where our American dyestuff industry will find itself after this shuffling of agreements is over?

The American dyestuff industry, clearly, is a scientific industry that is extremely *unscientific* in its methods of production and distribution. And yet now comes Mr. Frear and links the word "trust" to an industry that is further away from such a condition than any other industry in the country. Trust indeed! How confident we could feel had our industry even the slightest semblance of a trust, were its members even surreptitiously working toward such an end! With what undaunted arrogance could our dye industry endure the tapping of Mr. Frear's little hammer if only it were so closely bound together, so unified in its operations as to deserve the bare name of trust. With what confidence could our whole industry face the future if it could feel beneath it a bedrock of internal confidence and co-operation among its individual constituents. Mr. Frear, galloping quixotically to war against the pretty illusion that the American dyestuff industry is becoming too *strong* has drawn attention to its greatest weakness. And in this weakness the industry stands alone, pitted against a commercial league of nations.

AUGUST KLIPSTEIN

August Klipstein, founder of the firm of A. Klipstein & Co., New York, manufacturers and distributing agents of dyes, chemicals, varnish gums and tanners' supplies, died at his residence, 378 West End Avenue, on Friday, January 8th, in his seventy-eighth year.

Mr. Klipstein's business career is closely related to the rise of America's coal tar dyestuff and chemical industry. He was born in Germany in 1848 and there laid a sound foundation of scholastic and commercial education in the schools of Frankfort-on-the-Main and in valuable business connections, first with Gehe & Co., of Dresden, and later with chemical firms in London and Paris.



At the age of twenty-three Mr. Klipstein came to America and shortly after established a dye and chemical business under his name. Foreseeing the importance that dyestuffs must eventually assume in this country he obtained very early the agency of the Society of Chemical Industry of Basle, Switzerland, one of the most prominent and progressive of European dyestuff factories. Mr. Klipstein retained the agency until 1920, when it was released. Meanwhile, realizing that textile interests desired a common source of supplies for both their colors and their chemicals he successfully built up

connections for a wide and varied line of chemicals such as users of dyestuffs might need. On January 1, 1894, the business of A. Klipstein was transferred to the corporation, A. Klipstein & Co., under which name the business has been operated since and will be continued.

Immediately upon his arrival to this country Mr. Klipstein had entered into the social and business interests of his adopted country, and from this time dated his connection with various public and commercial enterprises. His never flagging energy, his business ability and his thorough knowledge of dyestuffs and related chemicals exerted a lasting influence upon the advancement of the art of dyeing in this country. To him belonged the credit of introducing first to American dyers many of the most valuable dyestuffs. Prominent among his introductions was that of quebracho, which he finally established in 1885 as a tanning extract of genuine importance after a number of years of hard work and disappointments. Before his death his contribution to the advancement of the entire chemical industry was generally recognized.

A widow, Hedwig, two sons, August and Herbert C and a daughter, Louise A., survive. At the time of his death Mr. Klipstein was a member of the Society of Chemical Industry, the American Chemical Society and the Chemists Club.

With the sincerest regret over the sudden termination of a long business acquaintance with Mr. Klipstein, The Reporter at this time desires to extend its sympathy to his family and friends and to the members of his organization.

RECENT LITERATURE

Dow, Indigo, Midland Vat Blues, Ciba Blues

The Dow Chemical Company, of Midland, Mich., has published for distribution to its customers an extremely handsome volume, entitled "Dow Indigo, Midland Vat Blues and Ciba Blues."

This volume is a combination text-book and sample book. It is handsomely bound in blue buckram, stamped with gold and contains as its first portion a treatise of 48 pages on the practical application of Indigo and Indigo derivatives, written by Dr. B. Wuth, technical expert of the Ciba Company, Inc., who act as sales agents for all Dow dyestuff products.

Dr. Wuth treats in great detail of the various phases of dyeing and printing Indigo and Indigo derivatives on all classes of yarns and fabrics. The work constitutes the latest and most authentic contribution to this all-important subject and should be a worthy addition to any technical library.

The second portion of the volume shows thirty-two sample pages carrying fifty-six swatches of piece goods dyed or printed with Dow Indigo, Ciba Blues or Midland Vat Blues. The range of fabrics shown is extremely wide and covers goods manufactured by some twenty-five representative American mills.

This volume, including both text and sample pages, was prepared entirely by Howes Publishing Company, publishers of the American Dyestuff Reporter, and is, we believe, one of the first volumes of its kind to be produced in America.

A much larger edition of the text alone, without samples, has been bound in paper covers. Copies of this edition may be had gratis upon application to Ciba Company, Inc., Cedar and Washington Streets, New York City.

ACETATE SILK—ITS DYES AND THEIR APPLICATION

(*Continued from page 44*)

Table No. XXXI

Colors Obtained by Developing SRA Black IV

Developer	Color
Direct (not developed)	Orange Brown
m-Phenylenediamine	Brownish-Black
Dimethylaniline	Deep purplish-Maroon
Resorcinol	Maroon
Naphthol AS	Reddish-Blue
B-Naphthol	Deep Purple
B-Hydroxynaphthoic Acid	Bluish-Black
m-Toluylenediamine	Black
SRA Black Developer HY Special	Black

Method No. 135: SRA Black IV on Celanese.—Dye at 80 deg. Cent. (176 deg. Fahr.) in a thirty to one bath containing 15 or 20 per cent of SRA Black IV and 1 gram per liter of olive oil soap for an hour and a half. The direct color will be an orange-brown. Rinse well and diazotize for a half-hour in a fifteen to one bath containing 5 per cent of sodium nitrite and 16 per cent of 28 deg. Tw. hydrochloric acid. Rinse again and immediately enter into a thirty to one developing bath at 35 deg. Cent. (95 deg. Fahr.) containing 2.5 per cent of *B*-hydroxynaphthoic acid, 0.6 per cent of caustic soda, 3 per cent of glue, and 3 per cent of 100 per cent acetic acid. During a half hour raise the temperature of the developing bath to 60 deg. Cent. (140 deg. Fahr.) and continue the development for about a half to three-quarters of an hour at this temperature. Where a greener tone of black is desired it may be shaded with SRA Golden Orange I. A jet black may be obtained with 16 per cent of SRA Black IV and 4 per cent of Orange I, developed as above. Care must be taken to insure complete development of the dye or the black color will redden on washing.

(*Part VI will appear in an early issue*)

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

DIAZINE BLACK OB

(Pre-war prototype Oxydiaminogen OB)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt at the boil and developed.

SHADE: Direct, a green shade; dull blue developed; a jet black with beta-naphthol.

SOLUBILITY: Excellent.

LEVEL: Dyes level.

EXHAUSTS: Moderately dyed direct.

FASTNESS TO:

Acid: Moderate; the shade turns bluer with dilute acetic.
Alkali: Fast.
Fulling: Good.
Ironing: Good.
Light: Same as S-333.
Perspiration: Poor.
Rubbing: Moderate.
Washing: Faster when developed.

OTHER PROPERTIES: Suitable for pad dyeing and for the production of gray tones. The direct shades give a good discharge with tin and zinc. The developed shade with beta-naphthol, metaphenylene diamine or resorcin give a good discharge with zinc but only fair with tin. Hydro gives a good discharge with the developed shade.

ON UNIONS: Developed with resorcin, a greenish black.

ON OTHER MATERIALS: Developed with metaphenylene diamine, a greenish shade of blue black.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company.

WOOL BLACK GR

(Pre-war prototypes Wool Black GR and Acid Black LD)

SPECIALLY SUITABLE FOR: Dyeing wool and printing yarn.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Black with a slightly greenish cast.

SHADE BY GASLIGHT: Bluer.

SOLUBILITY: Good.

LEVEL: Good.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Good.
Alkali: Moderate.
Fulling: Moderate.
Ironing: Fast.
Light: Same as the Naphthylamine Blacks.
Perspiration: Fast.
Rubbing: Fast.
Washing: Moderate.

OTHER PROPERTIES: Similar to S-217. Distinguished by its good penetration and its very good fastness to finishing. Well adapted for felt hat dyeing and pieces that are hard to penetrate.

PRINTING: Can be printed on woolen yarn and cloth; acid with chlorate of soda. Dyeings on wool can be discharged a cream shade with tin and white with zinc.

COMPETING PRODUCTS: Made in the United States by Cincinnati Chemical Works.

ACID CHROME BLUE FFB AND FFR

SPECIALLY SUITED FOR: Wool.

USUAL METHOD OF DYEING: Top and bottom chrome.

SHADE: Bright navy blues.

SHADE BY GASLIGHT: No change.

LEVEL: Dye level.

EXHAUSTS: Clear.

FASTNESS TO:

Acid Fast.
Alkali: Fast.
Carbonizing: Neutralized, good.
Fulling: Very good.
Light: Very Good.
Perspiration: Good.
Rubbing: Excellent.
Steaming: Good.
Sulphur: Excellent.
Washing Very good.

SENSITIVE TO METALS, LIME: Sensitive to copper and iron.

OTHER PROPERTIES: Both colors stand the Indigo test with hydrochloric acid.

ON UNIONS: White cotton effect threads are stained.

PRINTING: Well adapted for vigoureux printing with acetate and fluoride of chrome. The shades with fluoride of chrome are brighter. The fastness to fulling of

the print is good. They also stand the hot water test very well.

COMPETING PRODUCTS: Made in the United States by Garfield Aniline Works, Inc.

PARANOL DIRECT VIOLET R
(Pre-war prototype Benzo Violet RL)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Glauber salt and soda.

SHADE: Clear shade of violet.

LEVEL: Excellent.

EXHAUSTS Very well.

FASTNESS TO:
Acid: Good to acetic. Redder with sulphuric.
Alkali: Fast.
Boiling: Poor.
Chlorine: Fugitive.
Ironing: Temporarily redder.
Light: Good.
Perspiration: Fast.
Rubbing: Fast.
Sulphur: Fast.
Washing: Poor.

OTHER PROPERTIES: Suitable for pad dyeing and mercerizing.

ON OTHER MATERIALS: Adapted for cotton-wool unions and half-silk in a neutral bath. Silk is dyed in a bath of boiled off liquor broken with acetic.

PRINTING: Suitable for the printing of cotton-silk unions and cotton wool unions; also cotton and silk. In all cases with phosphate of soda. The dyed and also the printed shades on animal fibers are reddish violet and on vegetable fibers a bluish violet.

DISCHARGING: Discharges well with tin and zinc.

COMPETING PRODUCTS: Made in the United States by Garfield Aniline Works, Inc.

PONTAMINE DIAZO BORDEAUX 7B

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Dyed and developed with Developer A.

SHADE: A bluish Bordeaux considerably bluer than Rosanthrene (C. I. No. 324A).

SOLUBILITY: Good.

LEVEL: Good.

EXHAUSTS: Fairly well.

FASTNESS TO:
Acid: Very good to acetic and good against dilute mineral acids.
Alkali: Fast.
Boiling: Fair.
Chlorine: Very fugitive.
Cross-Dyeing: Good.
Ironing: Turns toward yellow.
Light: Better than Rosanthrene (C. I. No. 324-a).
Rubbing: Fast.
Washing: Good.

DYED BY OTHER METHODS: Dyes on silk in boiled-off liquor broken with acetic and developed with Dev. A. the dyeings are fast to water and when washed tint the white cotton only a little reddish. Well adapted for dyeing effect threads which are woven into cotton pieces mercerized and cross-dyed with sulphur colors.

ON UNIONS: Well adapted for cotton-wool piece goods with effect threads of cotton. In these the wool on navy blue and green and other shades is cross-dyed sour. Also adapted for obtaining Bordeaux shades on cotton-wool unions which will be fast to crocking. The wool portion of these unions is cross-dyed sour using Azo Grenadine, Azo Fuchsine, etc., after first dyeing the cotton at 90 deg. Cent. with Diazo Bordeaux 7B and then diazotizing and developing.

DISCHARGING: The developed dyeings on cotton discharge well with hydrosulphide or zinc dust. With itn salt they only discharge pink and with oxidizing agents reddish.

COMPETING PRODUCTS: Made in the United States by E. I. du Pont de Nemours & Co.

ALIZARINE BLUE BLACK B
(Schultz No. 862)

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Top and bottom chrome and chromate.

SHADE: Blue-black, similar in shade to S-181.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Good.

LEVEL: Very good, especially in light percentage.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Fast.
Alkali: Fast.
Fulling: Top-chrome good. On a mordant bleeds into white cotton and wool.
Light: In heavy navies suitable for men's wear. In light shades, moderate.
Perspiration: Fast.
Potting: Fairly fast
Steaming: Stands steaming.
Sulphur: Stands stoving.
Washing: Fast to washing.

SENSITIVE TO METALS, LIME: Not sensitive to metals.

MACHINE DYEING: Suitable. The Erio Chrome Blacks A, B, R and T are much faster to light in light percentage than Alizarine Blue Black B, but they cannot be used for the production of gray tones on slubbing or yarn in many instances on account of their great sensitiveness to metals. The usual method of dyeing the Alizarine Blue Black B in

(Continued on page 76)

The Reduction Products of Azo Dyes

Part VII

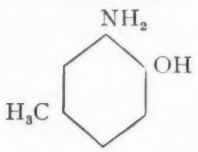
By WALTER C. HOLMES

Color Laboratory, Bureau of Chemistry

[EDITOR'S NOTE.—*The most practical and effective method for the identification of azo dyes consists in the isolation and identification of the products which they yield on reduction. This method finds less application than it might or should, partly because some of these products have never been isolated and investigated, and partly because much of the data which has been obtained in regard to such reduction products is greatly scattered and very difficult to locate.*

Mr. Holmes has made a search for all the available information on such reduction products, and this series contains a digest of his results with a systematic listing of the reduction products of the azo dyes published in the Colour Index, together with the available data on such properties and reactions as would be of service in their identification.]

No. 68.—m-AMINO-p-CRESOL



C_7H_9NO; Mol. Wt. 123.12; (C, 68.3% H, 7.4%; N, 11.4%; O, 13.0%).

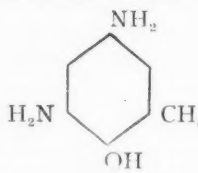
Derived from C. I. Nos. 104, 174, 212.

Scales (rhomb cryst. from ether), mpt. 135°. Sublimes easily in leaflets or needles. Very sl. sol. in H_2O but sol. in acids or alkalies. Readily sol. in alc., ether, or $CHCl_3$, much less so in C_6H_6.

The aqueous sol. of the hydrochloride (but not of the free base) is colored red by $FeCl_3$.

N-acetyl deriv., long needles (H_2O), mpt. 159-60°, very sl. sol. in cold H_2O, alc., ether and C_6H_6; *diacetyl deriv.*, large foliated cryst. or flat needles, mpt. 145°; *benzoyl deriv.*, shining, mother-of-pearl leaflets (alc.), mpt. 191°; *O-acetyl-N-benzoyl deriv.*, mpt. 134 deg.; *O-benzoyl-N-acetyl deriv.*, mpt. 146°.

No. 69.—3, 5-DIAMINO-o-CRESOL



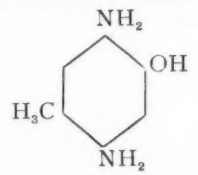
$C_7H_{10}N_2O$; Mol. Wt. 138.13; (C, 60.8%; H, 7.3%; N, 20.3%; O, 11.6%).

Derived from C. I. No. 8.

The free base is very unstable.

The hydrochloride cryst. in colorless needles; sol. in H_2O and alc. but insol. in ether.

No. 70.—2, 5-DIAMINO-p-CRESOL



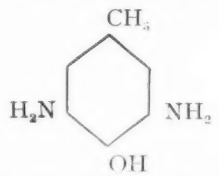
$C_7H_{10}N_2O$; Mol. Wt. 138.13; (C, 60.8%; H, 7.3%; N, 20.3%; O, 11.6%).

Derived from C. I. No. 292.

Does not appear to have been described in the literature. It may doubtless be distinguished from the foregoing diamine by treatment with alkaline α-naphthol sol., with which it would give the indophenol reaction (blue dye) whereas the m-diamine would not.

The *methyl ether* melts at 166° (decomp.). The *ethyl ether* melts at 108-9° and gives a monoacetyl deriv. which melts at 125° and a diacetyl deriv. which melts at 165°.

No. 71.—3, 5-DIAMINO-p-CRESOL



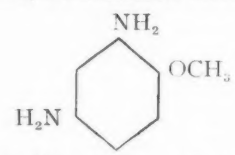
$C_7H_{10}N_2O$; Mol. Wt. 138.13; (C, 60.8%; H, 7.3%; N, 20.3%; O, 11.6%).

Derived from C. I. Nos. 8 and 96.

The phenol itself has not been described.

Its ethyl ether is a colorless oily liquid which distills undecomposed. The hydrochloride (of the ether) cryst. in white silky needles, very easily sol. in H_2O. It gives the chrysoidin reaction and other reactions characteristic of m-diamines. With $NaNO_2$ it gives a brown pptte. which dyes like Bismarck Brown. Heated with nitrosodimethylanilin in Ac OH sol. it gives a blue dye which is converted into a violet-red dye on long boiling.

No. 72.—2, 4-DIAMINO ANISOLE

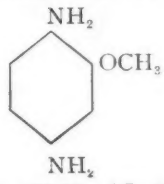


$C_7H_{10}N_2O$, Mol. Wt. 138.13; (C, 60.8%; H, 7.3%; N, 20.3%; O, 11.6%).

Derived from C. I. No. 118.

Gives a characteristic indamin with nitrosodimethylanilin hydrochloride, brown-red needles (C_6H_6), mpt. 258°.

No. 73.—2, 5-DIAMINO ANISOLE

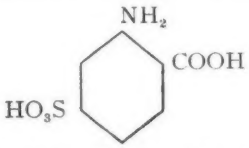


$C_7H_{10}N_2O$; Mol. Wt. 138.13; (C, 60.8%; N, 7.3%; N, 20.3%; O, 11.6%).

Derived from C. I. Nos. 117 and 291.

Apparently no data are available on this compound.

No. 74.—p-SULFO-ANTHRANILIC ACID



$C_7H_7NO_5S$; Mol. Wt. 217.16; (C, 38.7%; H, 3.3%; N, 6.4%; O, 36.8%; S, 14.8%).

Derived from C. I. No. 651.

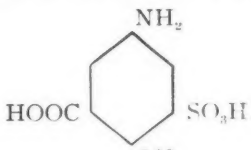
Colorless rhombic plates (yellowish when impure) containing one-half mol. H_2O. The hydrated acid darkens at 240° but fails to melt at 250°. Sl. sol. in cold H_2O, almost insol. in $CHCl_3$ and ether. Forms both an acid and neutral series of salts. The acid and its salts have a bluish-purple fluorescence in dilute sols.

The disilver salt with ethyl iodide gives *o-monoethyl-amino-p-sulfobenzoic acid,* yellow rhombs, mpt. 243° (decomp.).

It may be converted into *4-sulfophenyl-2-thioglycol-1-carboxylic acid* which gives characteristic thioindigo derivs. (Ber. *49*, 956).

100 gm. aq. sol. contain 1.048 gm. acid at 25°.

No. 75.—p-AMINO SULFO SALICYLIC ACID



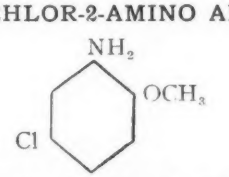
$C_7H_7NO_6S$; Mol. Wt. 233.16; (C, 36.0%; H, 3.0%; N, 6.1%; O, 48.0%; S, 13.8%).

Derived from C. I. No. 301.

Gray pdr., only mod. sol. in H_2O but readily sol. in presence of alkalies. It gives a red-brown color with chromic acid. The diazo comp. is diffic. sol.

[Neither the formula nor the description of properties are certain. There are three possible isomeric sulfo acids, and no thoroughly reliable data are available concerning them.]

No. 76.—4-CHLOR-2-AMINO ANISOL



C_7H_8ClNO; Mol. Wt. 157.57; (C, 53.3%; H, 5.1%; Cl, 22.5%; N, 8.9%; O, 10.2%).

Derived from C. I No. 116.

Needles, mpt. 82°, readily sol. in alc. with difficulty in ligroin.

Volatile with steam.

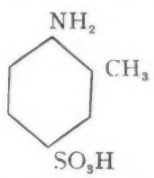
Picrate, needles, mpt. 194° (decomp.).

Acetyl deriv., needles (H_2O), mpt. 104°. On nitration this gives a nitro acetyl deriv. which melts at 193°.

Diazotized and coupled with: *β-naphthol,* dark red, prismatic needles with green reflex, mpt. 203°, red-violet sol. in H_2SO_4, red pptte. on dil.; *Naphthol AS,* dark red, prismatic needles (toluene), mpt. 237°, blue sol. in H_2SO_4, bluish-red pptte. on dil.

The amino group may be replaced by Cl, giving 2, 4-dichloranisole, orthorh. prisms, mpt. 27-8°, bpt. 232-3° at 743.5 mm., 125° at 100 mm.

No. 77.—2-TOLUIDINE-5-SULFONIC ACID
(m-sulfo-o-toluidine)



$C_7H_9NO_3S$; Mol. Wt. 187.18; (C, 44.9%; H, 4.8%; N, 7.5%; O, 25.6%; S, 17.1%).

Derived from C. I. Nos. 18, 161, 283 to 286 and 641.

Cryst. in rhombic prisms with $1H_2O$, which it loses over H_2SO_4. 100 pts. aq. sol. contain 2.69 pts. anhyd. acid at 11°, 100 pts. 70% alc. 2.105 pts. at 17.5°. Readily sol. in hot H_2O.

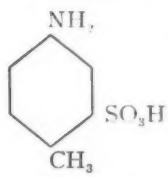
Ba salt (+ 3 (?) H_2O); large rhombic leaflets. Anhyd. salt sol. in 7.9 pts. H_2O.

Sulfamide; large four-sided prisms, mpt. 175°. Its hydrochloride; long, fine, silky needles, mpt. 240°.

The acid does not reduce ammon. Ag. sols. and gives no pptte. with bromine water. Cold aq. sols. are colored rose, then chrome-green by small amounts of PbO_2 (dark-violet with excess). With $FeCl_3$ it gives a green-yellow color, then olive and finally dark violet.

Aq. sols. heated to 180-200° give o-toluidine. With oxidizing agents toluquinone is formed.

No. 78.—4-TOLUIDINE-2-SULFONIC ACID
(o-sulfo-p-toluidine)



$C_7H_9NO_3S$; Mol. Wt. 187.18; (C, 44.9%; H, 4.9%; N, 7.5%; O, 25.6%; S, 17.1%).

Derived from C. I. Nos. 162 and 634.

Monocl. cryst. with $1H_2O$ which is not lost over H_2SO_4 100 gm. aq. sol. contain .45 gm. hydrated acid at 20°. Insol. in alc.

The *K salt* is very sol. in cold KOH sol. (in distinction from the K salt of m-sulfo-p-toluidine).

Sulfochloride; small colorless prisms, mpt. 124°. Its anilide cryst. in colorless rhomb. leaflets (alc.) mpt. 220-1°.

Sulfamide; mpt. 164°, difficultly sol. in cold H_2O. readily in hot.

The acid reduces ammon. Ag. sols. on warming. Cold aq. sols. are colored yellow-red by a little PbO_2, and bordeaux red if warmed with $FeCl_3$. Gives a diazo comp. with HNO_2 in presence of abs. alc. which is decomp. into o-toluol sulfonic acid and p-ethoxy-o-toluol-sulfonic acid by boiling with alc.

Technical Notes from Foreign Sources

Treating Animal and Vegetable Fibers

The treatment of animal and vegetable fibers by means of substances which have an alkaline or neutral reaction, by means of oxidizing agents or reducing agents has the effect of reducing their mechanical strength. The process, patented in French Patent No. 575,416, has for its purpose the elimination of this harmful action. This is accomplished by subjecting these fibers either before or during the treatment to the action of tannins and their transformation products or the artificial tannins, such as the neradols which are obtained by the condensation of aromatic sulpho-acids and the like with the aid of formaldehyde.

The following examples indicate the various ways in which this process may be applied.

In the first case 20 grams of wool are treated for a period of thirty minutes at a temperature of 60 deg. Cent. with a solution which contains 300 grams of anhydrous soda and from 10 to 15 grams of oak tannin in 5 liters of water. The wool is rinsed and dried. By this treatment the strength of the wool, as tested in a Schopper machine, is increased by 10 per cent and its extensibility by about 60 per cent, in comparison with the crude fiber, and without the tannin treatment the strength of the fiber is reduced about 20 per cent by the soda treatment.

In dyeing with sulphur colors the addition to the bath of 25 per cent of the concentrated tannin extract has the effect of increasing the strength of the fabric to an appreciable degree.

When wool is carbonized with the aid of sulphuric acid of 10 per cent concentration at a temperature of 90 deg. Cent. it is found that the addition of half a per cent of synthetic tannins such as neradol or ordoval has the same effect.

In bleaching wool with a solution of 1 per cent hypochlorite of soda at a temperature of 18 deg. Cent., 2 per cent of myrabolan tannin is added in the form of the commercial extract. This has the effect of enabling the fibers to retain their mechanical strength, for when no tannin is employed it is found that the treatment will reduce the mechanical resistance of the fiber by as much as 20 per cent.

When wool is treated for a period of two hours and at a temperature of 90 deg. Cent. with a solution of chromic acid of 4 per cent concentration, it loses approximately 50 per cent of its resistance to breakage. An addition of 1 per cent of a valonia tannin solution has the effect of protecting the fiber against the violent action of the oxidizing agent.

In the manufacture of wool from rags it is found very advisable to add to the reducing bath, which contains 5 per cent of hydrosulphite, approximately 1 per cent of tannin obtained by the sulphonation of wool grease.

Fifty grams of wool are treated with a solution containing 20 grams of sodium hydrosulphite to the liter of water to which there has been added 1 gram of peat humus which is dissolved in alkali. The treatment lasts for a period of ten hours at a temperature of 45 deg. Cent. Then the wool is compressed and washed. It is found that by this treatment the mechanical properties of the wool remain untouched.

In the development of Aniline Black on the vegetable fiber quebracho tannin is added to the fiber in the proportion of 10 per cent of the chlorate of soda that is employed in the process. Then in the subsequent chroming process it is advisable to add a quantity of tannin which is equal to 5 per cent of the weight of bichromate employed.

Retting Flax

In retting flax, hemp and other textile plants the material is heated in an autoclave under pressure for several hours in water which contains a small proportion of an alcohol of high molecular weight. As an example cyclohexanol, methylcyclohexanol, terpinol and high boiling acohols, such as benzyl alcohol are mentioned. It is also recommended to add a small quantity of soap toward the end of the boiling operation in order to facilitate the emulsification of the solvent. This process is patented in British Patent No. 236,590.

Dyeing Jute Fiber

In dyeing jute fiber, cocoanut fiber and the like with the aid of members of the basic series of coloring matters there is added to the dye liquor or to the wetting bath sulphite cellulose waste liquor or the active ingredients of the liquor, such as lignin sulphonic acid or lignin sulphonates or its conversion products which are obtained for example by chlorinating, oxidizing, dialyzing, fermenting or treating the liquor with alkali or acids. For example jute fiber is dyed in a bath which contains Rubin Crystals or Methyl Violet B, sulphite cellulose liquor and acetic acid. This process is patented in British Patent No. 236,525.

Discharge Effects on Bister Ground

A bister ground is obtained on cotton fabrics when the cloth which has been previously dyed with Paranitraniline Red is allowed to pass through a bath which consists of 50 per cent of tragacanth (80 per cent), 650 per cent of water, 50 parts of crystallized acetate of soda, 50 parts of acetin, 20 parts of Chromal Blue G and 40 parts of a solution of chromium acetate of 30 deg. Be. concentration. Then the fabric is dried. For the production of white effects the fabric is printed with a discharge paste which contains formaldehyde hydrosulphite and sodium citrate. When the fabric is printed with a chlorate-ferrocyanide discharge paste the Paranitraniline Red dyed parts of the fabrics are not touched, but the Chromal Blue is destroyed and the result is that red discharge effects are easily obtained.

When this process is used on a puce ground, which can be obtained by treatment of the fabric with a solution containing 10 grams of Indigosol DH, 40 c.c. of a 12 deg. Be. solution of ammonium chlorate and 940 c.c. of water, it is possible to obtain white effects, when the fabric is printed with a discharge paste containing chlorate and ferrocyanide as well as zinc oxide. Red discharge effects are obtained with the aid of an oxide discharge paste consisting of chlorate and ferrocyanide, while red resists are obtained by printing with the aid of an alkaline solution of sodium acetate. (Der Textilechemiker und Colorist, 1925, page 140.)

Wool Colors Fast to Potting

Potting or treating the fabric in boiling hot water and wet steaming is a process which but few of the mordant coloring matters, not to mention direct acid coloring matters, are able to withstand. In spite of this isolated cases are known where mordant coloring matters are designated in the trade as being fast to potting, which really cannot be so denoted. Some of these coloring matters are subjected to low temperatures and others to higher temperatures for a shorter or longer period of time, and for this reason the effects of temperature on the dyestuff vary very considerably. When the fabric is dyed with the coloring matter at low temperatures then the dyestuff will be found to resist the action of the heat. The question also concerns the condition, namely, whether or not the goods that are to be potted contain the white along with other colored parts or if it is to be colored in different dark shades only. When a fabric possesses white parts, then it is possible that the dyed parts of the fabric which are not resistant to the action of potting will run over into the white portions and the result is that the fabric is spoiled. A test may be performed on a small scale in the following manner: The dyed fabric is twisted around a glass rod in conjunction with a piece of while wood and also when necessary with a piece of white cotton goods. Then the mass of fabric is tied together with a piece of cord and then placed in a glass or porcelain vessel which contains distilled water at a temperature which varies between 90 and 95 deg. Cent. for a period of two hours. If the color is fast, then it should not bleed and discolor the white fabric.

There are a number of potting fast coloring matters among which may be mentioned the following: Chrome Fast Bordeaux 5BP, the chrome orange violets, Chromogen Violet B, Chromoxan Brilliant Violet SB, Anthracene Chrome Blue F, Chrome Fast Blue B, Chromoxan Brown 5R, Acid Anthracene Brown P, Chrome Fast Black PV, etc.

The yellow coloring matters are used particularly for the purpose of admixture with other dyestuffs. For example, Anthracene Yellow V, when used in producing deep shades, will bleed to a certain degrees. But when the coloring matter is employed in admixture with others this tendency to bleed is no longer noticeable. Chromoxan Pure Blue B gives a very clear blue shade. Navy blue or dark blue can be obtained by using different blues in admixture with Chromoxan Violet. Copper red shades are produced with the aid of yellow coloring matters in admixture with Chromoxan Brown 5R, or with yellow and Chromoxan Violet R.

A dark Bordeaux color can be obtained with the aid of yellow in admixture with Chromoxan Violet R. For bluish greens mixtures of yellow with Chromoxan Pure Blue B serve. Olive colors are obtained by mixing Chrome Cyanin T with Chrome Fast Yellow 3RP. When one of the browns is used in addition to these coloring matters, then there are obtained an entire range of gray and leather tones. As a general rule Indigo and the Helindone coloring matters are fast to potting. When suitable mixing of coloring is carried out it is possible to obtain with these vat coloring matters all possible stylish shades, blue, olive, green, brown, etc. (Deutscher Faerber Zeitung, 1925, page 1179.)

Lanolinification of Cotton

A wool-like handle and a linen-like firmness are imparted to cotton when the yarn or fabric is impregnated, either before or after bleaching and dyeing, with a solution which contains 8 liters of water, 800 grams of blood albumen, 1 liter of a suitable oil, such as Turkey Red oil, 60 grams of paraffine, 500 c.c. of a solvent for the paraffine and 200 grams of formaldehyde. Then the materials are piled or allowed to lie for several hours, then steamed, without previous dyeing, for a period of fifteen to twenty minutes, and allowed to pass through a 0.6 per cent solution of alum in water. Afterward the materials are rinsed, soaped and dried.

In a report made on this process it is suggested that a fabric cannot have both wool and linen-like properties, and it is reported that the linen-like and not the wool-like effect was obtained on calico and bleached nainsook by means of the aforedescribed process. White fabrics are yellowed by the process, formeldehyde is unnecessary and the change in handle is due to the action of the paraffine and the soluble oil.

For further details see Bull. Soc. Ind. Mulhouse, 1925, volume 91, pages 399-400.

DYESTUFF TABLES

(*Continued from page 71*)

gray tones is chromate. Some of the American made Alizarine Blue Black B dyes will not print vigoureux.

OTHER PROPERTIES: Largely used in conjunction with Violamine, Galleine, Alizarine Cyanine, Gallocyanine, Anthracene Blue and Violet S4B for the production of men's wear navies. Largely used in conjunction with Anthraquinone Green, Alizarine Cyanine Green, S. K. Y. Blue, Alizarine Rubinole 3G, and Alizarine Geranol for the production of light grays and mode shades on piece dyed worsteds.

ON OTHER MATERIALS: Printing: Suitable for wool and cotton printing. Printed on cotton with acetate of chrome a black is produced in heavy percentage and a gray in light percentage. Can be dyed on chrome padded and discharged cotton material, and is discharged white with oxidizing agents. It is also suitable for cotton yarn printing. Printed on wool (slubbing) with fluoride of chrome or acetate of chrome, gives a good black. Printed acid on pieces a fine black is produced.

COMPETING PRODUCTS: Made in the United States by Chemical Company of America under name of Alizarine Blue Black B; Zinsser & Co. under name of Alizarine Blue Black B; Ultro Chemical Company under name of Alizarine Blue Black B; Dyes & Chemicals, Inc., under name of Alizarine Blue Black B, and E. I. du Pont de Nemours & Co.

DIRECT FAST RED 12BL

(Schultz No. 332)

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With 15 per cent Glauber salt and 2 per cent soda.

SHADE: Bluer than Benzo Purpurine 10B.

SHADE BY GASLIGHT: Brighter and yellower.

SOLUBILITY: Good.

LEVEL: Very good on cotton and wool.

EXHAUSTS: Slowly on cotton. On wool clear.

FASTNESS TO:

Acid: Far better than Benzo Purpurine 10B; fast to acetic.
Alkali: Very good.
Chlorine: Slight.
Ironing Bleeds when ironed wet. Changes temporarily when ironed dry.
Light: Much better than Benzo Purpurine 10B.
Perspiration: Fast.
Rubbing: Fair.
Washing: In light percentage good against white cotton.

OTHER PROPERTIES: Recommended for linings on account of the excellent fastness to perspiration and light.

ON UNIONS: Adapted for cotton-wool unions and cotton-silk unions. In union dyeing the animal fiber is dyed deeper.

ON OTHER MATERIALS: Dyeings on wool after-treated with fluoride of chrome are fast to washing and fulling against white wool and fairly fast against white cotton. The fastness to stoving is also good.

PRINTING: Well adapted for wool printing. No interest for cotton printing.

DISCHARGING: Not dischargeable with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by Garfield Aniline Works, Inc.

NEW NEWPORT BROWN AND SCARLET

Leaflets recently issued by the Newport Chemical Works, Inc., describe the properties of two new products, Newport Direct Fast Brown T2G and Newport Direct Fast Scarlet 4BS. The leaflets contain swatches of cotton and of rayon showing the shades of these two colors.

Newport Direct Fast Brown T2G is described as possessing valuable features for dyeing cotton, rayon and silk. It is said to be of good solubility, to dye level and exhaust gradually and is therefore recommended not only as a self-color but as a base for other shades of brown. Its general fastness is stated to be good and fastness to steaming excellent. It discharges to a clear white.

Newport Fast Scarlet 4BS is used for dyeing cotton materials in all stages of manufacture. Its good solubility and level dyeing properties, states the leaflet, make it particularly valuable for machine dyeing. Its fastness to washing, cold water rinsing, acid and alkali are described as good. Because of its purity of shade it is also said to be of special interest for dyeing rayon. Pure silk is dyed well in an acid bath. Dyed neutral the shade is said to be much weaker. Lustron and Celanese effects are left white.

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Experienced textile print works chemist and colorist, university graduate, desires position. Middle aged, married. References. Address Chemist, 66 Marlboro Street, Newton, Mass.

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The volume also includes the reports of the Sub-Committees on Fastness to Perspiration, Fastness to Light, Fastness to Carbonizing and Fastness to Sea Water and of the Research Committee of the Association. These reports contain technical material of value to anyone concerned with the testing and application of dyestuffs.

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Index to Advertisers Appearing in This Issue

Althouse Chemical Co.	—
American Aniline Products, Inc.	—
American Laundry Machinery Co.	—
American Rapidase Company	X
Amid Duron Co.	—
Arabol Manufacturing Co.	—
Arkansas Co.	VIII
Arnold, Hoffman & Co.	XIII
Atlas Electric Devices Co.	—
Bosson & Lane	X
Campbell, John, & Co.	V
Carbic Color & Chemical Co.	XV
Ciba Co.	—
Corn Products Refining Co.	IX
Cowles Detergent Co.	VI
David, S. R., & Co.	XVI
Dunker & Perkins Co.	VIII
Du Pont de Nemours, E. I., & Co.	III
Dyer & Calico Printer	—
Fleischmann Co.	VI
Fortner, L. B., & Co.	—
Foster, Edward C.	—
Geigy Co., Inc.	—
Hussong Dyeing Machine Co.	VIII
Innis, Speiden & Co.	—
International Nickel Co.	—
International Salt Co.	V
International Textile Exposition	XIII
Jennings & Co.	XV
Kali Manufacturing Co.	VI
Klipstein, A., & Co.	Back Cover
Lewis, John D.	XV
Malt-Diastase Co.	—
National Aniline & Chemical Co.	XII
Newport Chemical Works	Front Cover
New York Color & Chemical Co.	X
Onyx Oil & Chemical Co.	VI
Pennsylvania Dye & Bleach Works	XIII
Permutit Co.	X
Roessler & Hasslacher	VII
Rohm & Haas Co.	IX
Sandoz Chemical Co.	IX
Society of Dyers and Colourists	Third Cover
Solvay Process Co.	—
Suter, Alfred	XIV
Textile Finishing Machinery Co.	Second Cover
Tolhurst Machine Works	XI
United Chemical Products Co.	XV
U. S. Color & Chemical Co.	VIII
Vellner, Eugene	—
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